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ABSTRACT

A 1 year preschool program and a summer elementary program in a model cities area southt to detect and remediate children's learning disabilities, and to evaluate remedial techniques. Thirty-three perceptually handicapped preschool children took a battery of eight tests, and daily received remediation through fine and gross motor training, and in applied skills and free play. The Ss achieved highly significant gains on the performance tests of the Wechsler Preschool and Primary Scales of Intelligence. Successful teacher/student interactions and parental cooperation contributed to gains. A major conclusion was the potential of early identification and intervention for reducing the estimated 10 to 15% of children who perform poorly. In the summer program, 40 perceptually handicapped Ss, mean age 10 years, from 5 elementary schools, took a battery of seven tests, and daily received remediation in reading, English composition, and mathematics, and perceptual and gross motor training. The Ss achieved significant gains on the Copying Page, and Reduction of Total Errors Plus Self-Correction and Poor Formations tests of the Slingerland Screening Tests for Identifying Children with Reading Disability; in the Figure-Ground and Form Constancy tests of the Frostig Developmental Test of Visual Perception; on arithmetic computation measured by the Metropolitan Arithmetic Test, and on the MotorTasks Test. (MC)

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Progress Report

# THE DETECTION AND REMEDIATION OF LEARNING DISABILITIES

Child Welfare Research and Demonstration Project

March 1, 1973

Supported by: Department of Health, Education and Welfare
Sponsored by: Androscoggin County Task Force on Social Welfare, Inc., Lewiston, Maine 04240
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# THE DETECTION AND REMEDIATION

# OF LEARNING DISABILITIES

# THE DETECTION AND REMEDIATION OF LEARNING DISABILITIES

## Introduction

The first year of operation of this project involved the expenditure of a disproportionate amount of effort in the solving of preliminary problems. Outstanding among these considerations was the arrangement of physical facilities. Recruiting and screening of pupils, scheduling of program, and matters of staff morale required immediate, constant, and full attention. Consequently, adequate control groups for the summer program, 1971, and the Preschool program, 1971-1972, could not be established. The initial screening was particularly laborious. Sifting out dyslexic tendencies from the chaos of cultural disadvantage, emotional disturbance, and bilingual confusion required investigation in depth of the entirety of conditions followed by intensive diagnostic sessions employing expert outside consultants. The preliminary screening necessarily had to be followed by adequate pre-testing employing additional devices. Time, personnel, and adequate physical facilities for testing imposed initial limitations on the ability of the staff to fulfill the condition of control groups. These problems were overcome for the second year of operation. Therefore the summer program, 1972, and the preschool program, 1972-1973, have well-determined control groups.

A report on the summer program, 1971, was previously submitted. This present report is in two parts: Part I, Preschool Program, 1971-1972; and Part II, Summer Program, 1972.

Part I

Preschool Program

September, 1971 to April, 1972

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# CHAPTER I

# THE PROBLEM

## The Statement of the Problem

This research evaluated the effects of methods of remediation of learning disabilities in preschool children upon their subsequent perceptual-motor ability and performance in specified areas of learning.

## Basic Hypothesis

It was hypothesized that a group of preschool children diagnosed as perceptually disabled (dyslexic) on the basis of careful screening procedures would be significantly improved in their learning ability as a result of the early application of remedial procedures. And, plus, will be equipped for genuine success in the regular school program.

## The Need for the Study

An estimated 10% - 15% of the children in our schools suffer from the perceptual-motor handicap known as dyslexia which results in their experiencing grave difficulties in speech, reading, writing, and spelling. These children have normal visual and auditory acuity and are of normal or superior intelligence but simply cannot acquire information from the printed page when taught by the usual methods. They are regarded by teachers and, sometimes, parents as naughty, bad or delinquent, uncooperative, lazy, or emotionally blocked when, in reality, they are reacting to the constant failure that they experience in trying to learn by the usual methods. They constitute a sizeable element of potential high school dropouts.

Children having potential learning problems can be detected at a preschool level before they experience crushing academic failure and carry with them scars for life with the lurking fear that they may encounter tasks that even though they try hard will never yield to their efforts. The need is for these children to be exposed to formative and corrective influences so that they will never have to suffer. The evidence to date is that the effectiveness of remediation of perceptually disabled children declines sharply with increasing age to the point where, if they are not detected by the 5th, 6th, or 7th grades, regardless of the teacher or techniques used, only 10% to 15% of them can be brought back to normal grade work. It is imperative to test the effects of remedial techniques applied at the preschool level upon subsequent academic performance and learning ability.

CHAPTER II

PROCEDURE IN COLLECTING DATA

The Setting

The data for this research was derived from preschool children residing in the Model Cities vicinity of Lewiston, Maine. The Model Cities area has a population of 11,025 individuals which represents 26% of the total city of Lewiston population of 41,779 (1970 census). Nearly 1,000 children under 5 years of age reside in this area. This group provided a pool of several hundred 4-year-old children from which 30 subjects with pronounced dyslexic tendencies were selected. The children in the program were selected by screening a large group of children recruited through extensive publicity. Initial recruits for screening came from Head Start program applicants whose parents were interviewed and had administered to them the School Entrance Check List. Children appearing as possible dyslexic cases were scheduled for full diagnostic testing. Contact was made with pediatricians, optometrists, psychiatrists, and psychologists in the area for referral of cases for testing. Newspaper ads,[1] public service radio announcements,[2] mimeographed flyers[3] distributed through residents in the Model Cities Area, and, finally, public addresses by the project director to Head Start parents meetings, Y.W.C.A. Mothers meetings, PTA meetings, and service clubs were utilized to acquire referrals of children for testing.

The remedial training program for the children was conducted in a former public school building, the Park Hill School, of Auburn, Maine.

1. See Appendix A
2. See Appendix B
3. See Appendix C

| | |
|---|---|
| School Entrance Check List | (Initial screening) |
| Wechsler Preschool and Primary Scale of Intelligence | (Initial Screening plus pre-and post-testing) |
| Frostig Developmental Test of Visual Perception | (Initial screening plus pre-and post-testing) |
| Motor Task Test | (Initial screening plus pre-and post-testing) |
| Body Image Test | (Initial screening plus pre-and post-testing) |
| Walker Readiness Test | (Selective initial screening) |
| Bender Gestalt Test | (Selective initial screening) |
| Illinois Test of Psycholinguistic Abilities | (Selective initial screening) |

The above tests were administered by four trained testers in conjunction with consultants who assisted in the analysis of test data, advised in interpretation, and in some instances engaged in direct administration of the tests to the children.

School Entrance Check List

The School Entrance Check List[1] was used as an initial screening device to collect relevant social information and to discover characteristics associated with the syndrome of childhood dyslexia. The 18 items on this check list have been extracted from the full Dyslexia Schedule as those most discriminating for purposes of routine survey or screening. Six or more "adverse responses" are regarded as probably a necessary condition for the diagnosis of dyslexia but not a sufficient condition.[1] Content validity, concurrent validity, and construct validity of the Dyslexia Schedule and the School Entrance Check List have been substantiated. The test-retest reliability of

1. McLeod, John, Dyslexia Schedule and School Entrance Check List Manual. Cambridge: Educators Publishing Service, Inc., 1969, P. 17.

the Dyslexia Schedule, from which the School Entrance Check List has been derived, is .92. In this research the information for the School Entrance Check List was acquired by the parent-education specialist through direct interview with the parents.

Wechsler Preschool and Primary Scale of Intelligence

The Wechsler Preschool and Primary Scale of Intelligence is designed especially to adequately appraise the abilities of the preschool child. It is specifically designed for use with children of ages 4 through 6½ years. This intelligence scale consists of eleven tests, six verbal and five Performance thus yielding a Verbal I.Q., a Performance I.Q. and a Full Scale I Q. The I.Q.'s here are deviation I.Q.'s which take into consideration the relationship of the child's score to the mean of his age group. The raw scores of each test are converted into scaled scores (a scale with a mean of 10 and a standard deviation of 3). The purposes of the use of this test in the present research were several-fold. First, it was used to assess the general intellectual level of the child to determine if he qualified intellectually for admission to the program. Secondly, it was used diagnostically as an indicator of dyslexic symptoms on the basis of certain typical patterns of responses. Thirdly, it was used as an instrument to assess gains in intellectual development through pre-and post-testing. Complete reliability coefficients have been determined for the individual tests at the various age levels with the verbal I.Q., the Performance I.Q., and the Full Scale I.Q. averaging at all age levels .94, .93, and .95, respectively.

Frostig Developmental test of Visual Perception

The Frostig Developmental Test of Visual Perception is designed to measure five operationally-defined perceptual skills, as follows:

Eye-Motor Coordination
Figure-Ground
Constancy of Shape
Position in Space
Spatial Relationships

The subtests were selected for their relevance to school performance particularly reading and writing. Scores on the test correlate with reading achievement in the normal first grade classroom between .40 and .50. Since reading is dependent upon perceptual abilities, it becomes important to detect perceptual dysfunction or lag at an early age. The author's contend that their "...research has shown that visual perceptual difficulties, regardless of etiology, can be ameliorated by specific training. The results of the test are interpreted in terms of raw scores, scale scores, perceptual age equivalents and perceptual quotients.

Motor Task Test

This test involved the assessment of the following gross motor skills: walking a balance beam forwards, backwards, and sideways; jumping rope; skipping; hopping on the right foot and on the left foot; throwing and catching a ball; and, finally, bouncing a ball with the right hand, the left hand, and both hands. These activities were filmed on super 8 movie film pre- and post- and then each activity was viewed on a movie screen and rated on a 5-point scale[1] for skill of performance by 5 judges. The ratings of the judges were

1. See Appendix

averaged for the final score. Although the viewings by the judges were simultaneous, with pre- and post-films presented in random order, their ratings were made independently and discussed after each subject was viewed. Thus, a shared, stable frame of reference for judgement was maintained.

## Body Image Test

The Body Image Test[1] assessed the ability of the child to accurately identify the following body parts: shoulders, hips, head, ankles, ears, elbows, eyes, feet, and mouth. The child was rated both pre- and post- on a 3 point scale by an individual tester in terms of decisive accurate identification (3 points), hesitant, but accurate identification (2 points), or total uncertainty (1 point).

## Walker Readiness Test for Disadvantaged Preschool Children

This test was specifically designed for assessing weaknesses of culturally disadvantaged preschool children enrolled in Head Start and Day Care Centers throughout the United States. The test contains items "...based on pictures and symbols which do not require reading ability but which would test a child's listening ability; visual acuity; imagery; ability to follow instructions; and recognition of similarities, differences, numerical analogies, and missing parts.[2] The score is the number of correct answers out of a possible 50 points. This score is then interpreted in terms of percentile ranks based upon extensive normative groups. This test was used in this present research project

1. See Appendix E

2. Education News Services, Prep Brief No. 22. "A Readiness Test for Disadvantaged Preschool Children," U.S. Department of Health, Education, and Welfare, Office of Education/National Center for Educational Communication, P. 3.

in special cases where cultural disadvantage and verbal limitation due to bilingualism were severe.

## Bender-Gestalt Test

The Bender-Gestalt test is based upon designs originally used by Wertheimer in his studies of visual perception. The subject is required to copy each of nine simple designs on a sheet of paper. Although the attempts to quantify responses to the test have been limited, the test is widely used as a clinical instrument to estimate maturation, intelligence, psychological disturbances, the effects of injury to the Cortex, and the effects of convulsive therapy. The research literature supports the contention that considerable discriminating differences in terms of capacities of individuals to respond to the total stimulus situation can be found. In the present research this test was selectively used with various subjects in search of deviant responses indicative of perceptual problems.

## Illinois Test of Psycholinguistic Abilities

The ITPA is a battery of ten basic tests and two supplementary tests designed to differentiate and assess various facets of cognitive ability relating to Osgood's principles of the communication process. The authors assert that "its objective is to delineate specific abilities and disabilities in children in order that remediation may be undertaken when needed."[1] It serves as a model both for diagnosing learning problems and for programming remedial procedures. The authors further assert that "the ITPA bears the

---

[1] Kirk, S.A., McCarthy, J.J., and Kirk, W.D., Examiner's Manual: Illinois Test of Psycholinguistic Abilities. Revised Edition. University of Illinois, 1968, p. 5.

the same relation to the field of communication and learning disorders that diagnostic reading tests bear to the field of reading."[1]

The twelve subtests of the ITPA are as follows:

1. Auditory Reception
2. Visual Reception
3. Visual Sequential Memory
4. Auditory Association
5. Auditory Sequential Memory
6. Visual Association
7. Visual Closure
8. Verbal Expression
9. Grammatical Closure
10. Manual Expression
11. Auditory Closure
12. Sound Blending

In this present research the ITPA was used selectively for diagnostic purposes and remediation procedures.

Content and Methods of Remediation

The staff consisted of the following members:

1 Project director (part-time)
1 Assistant project director
1 Parent education specialist
2 Perceptual-motor specialists
1 Gross motor specialist
2 Teaching-aides
1 Secretary (Part-time)
1 Cook (Part-time)
1 Cook-aide (Part-time)
1 Custodian (Part-time)
4 Drivers (Part-time)

3 aides from Neighborhood Youth Corps
6 volunteer college students[2]

[1] Ibid.

[2] These students averaged approximately 5 hours each week working with individual cases needing special help such as speech therapy. Two extreme cases were transported weekly to a speech therapist who not only worked with the children but instructed the college students in carrying out weekly assignments with each child. This work was carefully supervised by the project director and independent study credit was earned by the students from Bates College.

Although members of the staff had prior experience working with preschool children, intense preliminary and continuing training for work with perceptually disabled children was necessary. A week of training before the program began employing outside consultants in the general field of dyslexia and experts in the training of preschool children was carried out. Attendance of both Head Start training sessions and conferences on learning disabilities as well as visitation of nursery schools provided continuous motivation and guidance. In addition, staff meetings were held at the close of each day's sessions for the immediate handling of problems, the discussion of the needs of individual children, and the reporting of progress.

The program was run in two separate sessions. One group of 15 children attended in the morning and another group of similar size attended in the afternoon. The remedial training was based upon four 35 minute periods fitted into a schedule as follows:

| | |
|---|---|
| 8:45 - 9:00 | Snack |
| 9:00 - 9:35 | 1st Period |
| 9:35 -10:10 | 2nd Period |
| 10:10 -10:45 | 3rd Period |
| 10:45-11:20 | 4th Period |
| 11:20 -11:40 | Lunch |
| 11:40 -11:45 | Brushing teeth |
| 11:45 -12:00 | Outside Play |
| 12:00 | Return |
| 12:00 -12:20 | Lunch |
| 12:20 -12:25 | Brushing teeth |
| 12:25 - 1:00 | 1st Period |
| 1:00 - 1:35 | 2nd Period |
| 1:35 - 2:10 | 3rd Period |
| 2:10 - 2:45 | 4th Period |
| 2:45 - 3:00 | Outside Play |
| 3:00 | Return home |

each child spent a full period in each of four classifications of activity consisting of the following:

Perceptual-Motor Training
Applied Skills
Gross Motor Training, and
Free Play

The activities employed under these four designations were derived from a wide range of sources of which the following were representative:

A Creative Guide for Preschool Teachers, Joanne Wylie, Western Publishing Educational Services, Racine, Wisconsin (1965)

Activities for Developing Visual Perception, Polly Behamann, Academic Therapy Publications, San Rafael, California, 94901 (1970)

Daily Sensorimotor Training Activities, William T. Braley, Geraldine Konicki, and Catherine Leedy, Educational Activities, Inc., Freeport, N.Y. 11520 (1968)

Developmental Sequences of Perceptual-Motor Tasks. Bryant J. Cratty, Educational Activities, Inc. Freeport, N.Y. 11520.

Movement, Perception and Thought, Bryant J. Cratty Educational Activities, Inc., Freeport, New York 11520 (1969)

Perceptual Training Activities Handbook. Betty Van Witsen, Teachers College, Columbia, University, N.Y., N.Y. 10027

Teacher's Guide to accompany Early Childhood Curriculum: A Piaget Program by Celia Stendler Lavatelli, American Science and Engineering, Inc., New York, (1970 )

The Remediation of Learning Disabilities, Robert E. Valett, Fearson Publishers, Palo Alto, California

Teaching Through Sensory-Motor Experiences. Academic Therapy Publications, San Rafael, California.

The heart of the remedial approach was the perceptual-motor training which took place in two small rooms with 2 perceptual-motor specialists, each with 2 children at a time. Thus, with 2 perceptual-motor specialists, 4 children could be dealt with during each of the four 35 minute periods.

The perceptual-motor activities were aimed at developing the following areas of skill:

Visual perception
Auditory perception
Kinesthetic perception
Tactile perception
Laterality
Directionality
Time orientation
Fine motor control
Conceptual: classification, number, measurement, space and seriation.

An important part of this training was The Frostig Program for the Development of Visual Perception which utilizes worksheets designed to develop skills in the following areas:

Visual-Motor Coordination
Figure-Ground Perception,
Perceptual Constancy,
Position in Space, and
Spatial Relationships

It is described by the authors as "...intended to be both corrective and preventive"[1] and "...for use not only by specialists in the field of visual perception training, but also by regular primary-grade teachers and by teachers of special classes for children with learning difficulties."[2] This material was used daily for part of

---

[1] Frostig, M. and Horne, D. Teacher's Guide. The Frostig Program for the Development of Visual Perception. Chicago: Follett Educational Corporation, 1964, Preface.

[2] Ibid.

the perceptual-motor training period with each child.

The further development of the various relevant areas of skill was attempted by making use of carefully selected materials expressly designed and commercially produced for the designated purpose and by employing activities recommended by experts and accomplished workers in the field. The perceptual-motor training curriculum thus included a wide range of materials with their directed uses and other activities of which the following are representative:

Materials

- Block designs
- Number puzzles
- Flash cards
- Sound pictures
- Geometric forms
- Kinesthetic alphabet cards
- Felt shapes
- Beaded numbers
- Tape markers for hand and foot
- Space concept cards

- Playskool clocks
- Bean bags
- Cuisenaire rods
- Cuisenaire geometric form boards
- Color pictures
- Abacus
- Piaget demonstrational materials
- Reading Readiness Cards

Activities

- Visual memory exercises
- Auditory memory exercises
- Scanning activities
- Sorting activities
- Spatial concept activities
- Card games
- Printing
- Paper folding
- Indicating time and days of week
- Bead stringing
- Chalkboard drawing and number writing

Visual Tracking
Coordination activities with bean bags, suspended balls, etc.
Putting correct number of objects in numbered cups and other counting activities
Similarity and difference recognition activities
Picture Interpretation

Furthermore, whatever techniques, in keeping with sound theoretical orientation, that an ingenious teacher could devise were made use of.

The applied skills activity was an extension of the perceptual-motor training into a group setting of four children engaging in game-type activities designed to maintain a high level of motivation. This was planned by the perceptual-motor specialists in cinjunction with a teacher-aide and conducted by the teacher-aide who was assisted by a younger member from the Neighborhood Youth Corps.

There was continuous conscious effort to integrate these activities with the specific training the children received from the perceptual-motor specialists. The activities employed here could be grouped within the following four categories:

Arts and crafts
Group games and activities
Dramatic play and language arts
Individualized activities in a group setting

Drawing, pasting, cutting, printing, and weaving were the most frequently employed arts and crafts. "Simon Says", circle games involving coordination and recognition of laterality, singing, bingo, and diversified recognition games were typical group activities. Dramatic play and language arts, effective in developing the expressive qualities of children, included acting out favorite children's stories, imaginative play with dolls and kitchen facilities

and finger plays. Finally, many individualized activities enhanced by the social facilitation of a group setting were found effective. These included assembling children's jig-saw puzzles involving recognition of congruities and figure-ground distinction, building with blocks, practicing activities such as zipping, tying and buttoning, playing with cars and trucks, utilizing a motorized rotary pegboard, operating a VAKT integrator and engaging in numerous sorting and counting activities.

The free play activity was supervised by a teacher-aide assisted by a person from the Neighborhood Youth Corps. The purpose of this activity was primarily to furnish relaxation for the child in the midst of a fairly rigorous structured program. The activities had certain remedial value by supplementing the more structured coordination activities with tricycle riding, sawing and nailing together soft celotex at a workbench, climbing on jungle-bars, playing in a sandbox, bowling, playing with modeling clay and water painting. In addition to the indoor basement area where the aforementioned activities took place, there was an outside play area equipped with swings, slides, climbing bars, and a sand box.

The Gross-motor training was conducted by the specialist in that area working with 4 children at a time in a large carpeted room equipped with gymnasium mats and designed for comfort in the execution of physical exercises. The Gross-motor specialist was assisted by a younger member from the Neighborhood Youth Corps in a wide range of activities including the following:

Coordination exercises to music
Marching to musical rhythms
Dancing
Skipping
Jumping Rope
Throwing and catching ball
Bouncing a ball
Walking on a balance beam
Standing on a balance board
Crawling
Walking
Running and
Turning

The activities were utilized primarily to develop the gross motor coordination upon which fine motor skill such as handwriting may be based. In addition, these activities served to reduce neuromuscular tension and to increase strength and endurance.

The aforementioned techniques of remediation were fitted into the context of a therapeutic relationship between each staff member and each child. Furthermore, a relationship of trust between the parents and the staff was fostered by the parent-education specialist who also served to integrate the work of the staff with other community agencies.

# CHAPTER III

## RESULTS: TREATMENT AND INTERPRETATION OF DATA

This chapter presents the statistical treatment of the data of the research and an interpretation and discussion of the results. First, the statistics descriptive of the preschool group in regard to age, sex, and intelligence will be presented. Secondly, the statistical procedure utilized to evaluate the data indicating the extent of learning will be outlined. Thirdly, the statistics indicating the extent of learning from pre- to mid-testing and from pre- to post-testing will be presented.

### Statistics Descriptive of the Preschool Group

Table I page 19, presents the mean age of the 20 male preschool children as 4.67 years and mean age of the 7 female preschool children as 4.42 years. Thus the male and female children are roughly comparable in age with a combined mean age of 4.75 years.

TABLE I

Description of Preschool Group with Regard to Sex and Age

| | Male | Female |
|---|---|---|
| N | 20 | 7 |
| Percentage | 74 | 26 |
| Age: Mean | 4.8705 | 4.4281 |
| Range | 4.003-5.250 | 3.915-5.166 |
| Mean | 4.7558 | |
| S.D. | 0.5791 | |

Table II, page 21, presents the intelligence levels of the subjects as measured on the Wechsler Preschool and Primary Scale of Intelligence. Mean verbal I.Q. scores, mean performance I.Q. scores and mean full scale I.Q. scores for both male children and female children fall within the normal range. The mean I.Q. scores of the female children are slightly higher than the mean I.Q. scores of the male children. Finally, the combined mean I.Q. score for males and females is 5.223 points higher in the verbal category (98.1852) than it is in the performance category (92.9629), with a combined male and female full scale I.Q. score of 95.333.

TABLE II

Description of Preschool Group with Regard to Sex and Intelligence*

| | Male | | Female |
|---|---|---|---|
| N | 20 | | 7 |
| Verbal I.Q. | | | |
| Mean | 96.8500 | | 102.000 |
| Range | 71-115 | | 89-116 |
| Mean | | 98.1852 | |
| S.D. | 10.1738 | 10.4272 | 9.3954 |
| Performance I.Q. | | | |
| Mean | 92.1000 | | 95.4286 |
| Range | 63-120 | | 84-108 |
| Mean | | 92.9629 | |
| S.D. | 14.4262 | 13.6902 | 10.9523 |
| Full Scale I.Q. | | | |
| Mean | 94.1500 | | 98.7143 |
| Range | 71-113 | | 85-109 |
| Mean | | 95.3333 | |
| S.D. | 10.3937 | 11.1952 | 10.3711 |

* As indicated on the Wechsler Preschool and Primary Scale of Intelligence

Statistical Procedure

In order to determine the extent of remediation in a preschool group of children by evaluating the group prior to the remediation training and after the remediation training for aspects of intellectual functioning, perceptual ability, motor skills, and body image the "t" method for assessing the significance of the differences between correlated means of small samples was used. The following steps were taken:

1. The scores for each measure, pre- and post-, were obtained for each S in the class.
2. The difference between each pre- and post-score for each measure was obtained for each S in the class.
3. The means and standard deviations of these means were calculated.

By using the following formula and going into the "t" tables with N-1 degrees of freedom, it was possible to determine whether these differences were significant at the five per cent level of confidence:[1]

$$t = \frac{Mdi}{\sqrt{\frac{\sum x^2 d}{N\,(N-1)}}}$$

where mdi = mean of the N difference of paired observations

xd = deviation of a difference from the mean of the differences.

The means and standard deviations of the differences of each measure indicated the extent to which the remediation objectives were obtained, and the measure obtained with the "t" formula indicated whether or not these differences were significant at the five per cent level

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[1] J.P. Guilford, Fundamental Statistics in Psychology and Education (New York: McGraw-Hill, 1950), p. 228.

of confidence.

In order to assess progress of remediation, midterm testing of certain aspects of intellectual functioning was employed. The aforementioned procedure for assessing the significance of differences from pre- to post-testing was applied to the assessment of gains from pre- to mid-term testing.

Extent of Remediation in Preschool Group

The problem was to determine the extent of remediation of learning disablement in a group of preschool children by evaluating the group prior to the remedial training and after the remedial training for aspects of intellectual functioning, perceptual ability, motor skills and body image.

Extent of Progress of Remediation at Mid-term

In order to assess progress of remediation, mid-term testing of certain aspects of intellectual functioning was employed. Table III, page 25, presents the mean pre-test, mid-term test, and gains scores, the standard deviations of these scores and the "t" ratios of the preschool group on selected subtests of the Wechsler Preschool and Primary Scale of Intelligence. These subtests were selected on the basis of their high correlation with scores of other measures of perceptual and cognitive functioning of particular significance in learning disablement.

Examination of Table III reveals positive gains in all four subtests (Similarities, Picture Completion, Mazes, and Geometric

Design), but statistical significance of the gains scores only in Picture Completion (.05 level) and Geometric Design (.002 level).

TABLE III

Mean Pre-test, Mid-test, and Gains Scores on Selected Subtests of The Wechsler Preschool and Primary Scale of Intelligence

| Test | | N | (Scaled Score) Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|---|
| Similarities | Pre- | 24 | 11.040 | 2.7510 | | |
| | Mid- | 24 | 12.360 | 2.7820 | | |
| | *Gains | | 1.320 | 3.2903 | 1.0435 | N.S. |
| Picture Completion | Pre- | 26 | 10.037 | 2.5235 | | |
| | Mid- | 26 | 11.296 | 2.7006 | | |
| | Gains | | 1.259 | 2.7276 | 2.2284 | .05 |
| Mazes | Pre- | 28 | 9.741 | 2.7817 | | |
| | Mid- | 28 | 10.704 | 2.2155 | | |
| | Gains | | 0.963 | 2.7755 | 1.9245 | N.S. |
| Geometric Design | Pre- | 27 | 7.630 | 2.7289 | | |
| | Mid- | 27 | 9.444 | 3.0925 | | |
| | Gains | | 1.814 | 2.8352 | 2.6510 | .002 |

* Pre-test scaled score subtracted from mid-test scaled score
**Level of significance on two-tailed test

## Statistics on the Verbal Tests of Wechsler Preschool and Primary Scale of Intelligence

Table IV, page 27, presents the mean pre-test, post-test, and gains scores, the standard deviations of these scores, and the "t" ratios of the verbal tests of the Wechsler Preschool and Primary Scale of Intelligence.

Inspection of Table IV reveals that with the exception of vocabulary all verbal subtest gains were positive, but only in the area of Arithmetic was the gain significant at the .05 level. On the vocabulary subtest there was a mean loss which, however, was not significant at the .05 level.

TABLE IV

Mean Pre-test, Post-test, and Gains Scores on the Verbal Tests of Wechsler Preschool and Primary Scale of Intelligence

| Test | | N | (Scaled Score) Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|---|
| Information | Pre- | 27 | 8.9630 | 2.2951 | | |
| | Post- | 27 | 9.4815 | 2.6365 | | |
| | *Gains | | 0.5185 | 2.7561 | 0.9768 | N.S. |
| Vocabulary | Pre- | 26 | 10.1538 | 2.2749 | | |
| | Post- | 26 | 9.2307 | 2.4707 | | |
| | Gains | | -0.9231 | 3.3046 | -1.4195 | N.S. |
| Arithmetic | Pre- | 27 | 9.4444 | 2.7080 | | |
| | Post- | 27 | 10.2592 | 2.1942 | | |
| | Gains | | 0.8148 | 2.0198 | 2.0837 | .05 |
| Similarities | Pre- | 25 | 11.0400 | 2.7610 | | |
| | Post- | 25 | 11.6800 | 3.0210 | | |
| | Gains | | 0.6400 | 3.7553 | 0.8521 | N.S. |
| Comprehension | Pre- | 20 | 9.2000 | 2.2384 | | |
| | Post- | 20 | 9.7000 | 2.6773 | | |
| | Gains | | 0.5000 | 2.8650 | 0.5944 | N.S. |
| Verbal Score | Pre- | 27 | 98.1851 | 10.3317 | | |
| | Post- | 27 | 99.2592 | 12.5772 | | |
| | Gains | | 1.0741 | 10.4272 | 0.5208 | N.S. |

* Pre-test scaled score subtracted from post-test scaled score

** Level of significance on two-tailed test

## Statistics on the Performance Tests of Wechsler Primary Scale of Intelligence

Table V, page 29, presents the mean pre-test, post-test, and gain scores, the standard deviations of these scores and the "t" ratios of the performance tests of the Wechsler Preschool and Primary Scale of Intelligence.

Inspection of Table V reveals highly significant gains on all subtests except Animal House which, although falling short of significance, had a positive gain.

TABLE V

Mean Pre-test, Post-test and Gains Scores on the Performance Tests of the Wechsler Preschool and Primary Scale of Intelligence

| Test | | N | (Scaled Score) Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|---|
| Animal House | Pre- | 27 | 8.6666 | 1.9806 | | |
| | Post- | 27 | 9.1852 | 2.4657 | | |
| | *Gains | | 0.5185 | 1.8886 | 1.4306 | N.S. |
| Picture Completion | Pre- | 27 | 9.7407 | 2.7954 | | |
| | Post- | 27 | 11.6666 | 2.8955 | | |
| | Gains | | 1.9259 | 3.1215 | 3.3439 | .01 |
| Mazes | Pre- | 27 | 9.3333 | 3.0884 | | |
| | Post- | 27 | 10.9629 | 2.7242 | | |
| | Gains | | 1.6296 | 2.5742 | 3.3901 | .01 |
| Geometric Design | Pre- | 27 | 7.9629 | 2.8077 | | |
| | Post- | 27 | 10.4814 | 3.5881 | | |
| | Gains | | 2.5185 | 3.4123 | 3.8373 | .002 |
| Block Design | Pre- | 25 | 9.3200 | 2.8243 | | |
| | Post- | 25 | 11.4000 | 3.3541 | | |
| | Gains | | 2.0800 | 2.3965 | 4.3396 | .002 |
| Performance Score | Pre- | 27 | 92.9629 | 13.8412 | | |
| | Post- | 27 | 104.8148 | 16.8391 | | |
| | Gains | | 11.8519 | 13.6902 | 4.8211 | .002 |

* Pre-test scaled score subtracted from post-test scaled score
** Level of significance on two-tailed test

## Statistics on the Full Scale of Wechsler Preschool and Primary Scale of Intelligence

Table VI, Page 31, presents the mean pre-test, post-test, and gains scores, the standard deviations, and the "t" ratio of the full scale of the Wechsler Preschool and Primary Scale of Intelligence.

Inspection of Table VI reveals the gain was highly significant at the .002 level.

TABLE VI

Mean Pre-test, Post-test and Gains Scores on the Full Scale of the Wechsler Preschool and Primary Scale of Intelligence

| | | N | (Scaled Score) Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|---|
| Full Scale Score | Pre- | 27 | 95.3333 | 21.9271 | | |
| | Post- | 27 | 102.0740 | 14.2576 | | |
| | *Gains | | 6.7407 | 11.1952 | 3.5647 | .002 |

* Pre-test scaled score subtracted from post-test scaled score
** Level of significance on two-tailed test

## Statistics on the Frostig Developmental Test of Visual Perception

Table VII page 33, presents the mean pre-test, post-test, and gains scores, the standard deviations of these scores and the "t" ratios on the Frostig Developmental Test of Visual Perception.

Inspection of Table VII reveals significant gains were made in figure-ground perception, perception of form constancy and on the total score. Positive gains but not to the level of significance at the .05 level were made in position in space and spatial relations. The fact that significant positive gain did not occur on the spatial relations subtest is very likely due to the fact that children under 5 years of age are automatically assigned a scale score of 10 regardless of any obtained score. Any gain indicated on this subtest had to be the result of gains made by children 5 years of age or above at post-test time. In eye-motor coordination there was a negative gain but not to the level of significance at the .05 level. It was the opinion of the tester that the children responded to this set of items with uncharacteristic carelessness. This may have been partially due to the fact that the children now considered it too easy and thus showed undue haste although producing only minor inaccuracies, nevertheless, resulted in loss of credit.

TABLE VII

Mean Pre-test, Post-test and Gains Scores on the Frostig Developmental Test of Visual Perception

| Test | | N | (Scaled Score) Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|---|
| Eye-Motor Coordination | Pre- | 27 | 9.2222 | 1.8257 | | |
| | Post- | 27 | 8.7037 | 1.5143 | | |
| | *Gains | | -0.5185 | 1.7681 | -1.7681 | N.S. |
| Figure Ground | Pre- | 27 | 8.7037 | 2.0534 | | |
| | Post- | 27 | 9.9629 | 3.8832 | | |
| | Gains | | 1.2592 | 2.2290 | 2.9372 | .01 |
| Form Constancy | Pre- | 25 | 9.9200 | 3.3281 | | |
| | Post- | 25 | 11.7600 | 3.0859 | | |
| | Gains | | 1.8400 | 3.5435 | 2.5963 | .02 |
| Position in Space | Pre- | 27 | 9.1852 | 1.9618 | | |
| | Post- | 27 | 10.0370 | 1.9111 | | |
| | Gains | | 0.8518 | 2.7464 | 1.6082 | N.S. |
| Spatial Relations | Pre- | 27 | 9.5926 | 0.9306 | | |
| | Post- | 27 | 9.7407 | 1.4830 | | |
| | Gains | | 0.1481 | 1.3785 | 0.5654 | N.S. |
| Total | Pre- | 25 | 47.0000 | 7.3257 | | |
| | Post- | 25 | 50.5600 | 7.1884 | | |
| | Gains | | 3.5600 | 5.7087 | 2.6533 | .02 |

* Pre-test score subtracted from post-test score
** Level of significance on two-tailed test

## Statistics on Motor Tasks Test

Table VIII, page 35, presents the mean pre-test, post-test and gains scores, the standard deviations of these scores, and the "t" ratios on the motor tasks test.

Inspection of Table VIII reveals positive gains at high levels of significance on all tasks except jumping rope, and throwing and catching a ball which, nevertheless, showed positive gains but at less than the .05 level of significance.

TABLE VIII

Mean Pre-test, Post-test, and Gains Scores on Motor Tasks

| Test | | N | Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|---|
| Balance Beam Forwards | Pre- | 25 | 2.2240 | 0.8069 | | |
| | Post- | 25 | 3.5120 | 0.7917 | | |
| | *Gains | | 1.2880 | 1.0454 | 6.17018 | .002 |
| Balance Beam Backwards | Pre- | 26 | 1.2923 | 0.3631 | | |
| | Post- | 26 | 1.9231 | 0.5907 | | |
| | Gains | | 0.6308 | 0.4757 | 6.75246 | .002 |
| Balance Beam Sideways | Pre- | 24 | 1.6750 | 0.5620 | | |
| | Post- | 24 | 2.2583 | 0.7730 | | |
| | Gains | | 0.5833 | 1.0222 | 2.79358 | .02 |
| Jumping Rope | Pre- | 26 | 2.9385 | 0.8251 | | |
| | Post- | 26 | 3.1000 | 0.7424 | | |
| | Gains | | 0.1615 | 0.8295 | 0.98354 | N.S. |
| Skipping | Pre- | 26 | 1.7538 | 1.2295 | | |
| | Post- | 26 | 3.4800 | 0.9539 | | |
| | Gains | | 1.7360 | 1.1175 | 7.78437 | .002 |
| Hopping Right Foot | Pre- | 23 | 2.5391 | 1.1125 | | |
| | Post- | 23 | 3.3739 | 0.9328 | | |
| | Gains | | 0.8348 | 0.7049 | 5.64663 | .002 |
| Hopping Left Foot | Pre- | 24 | 2.4125 | 1.1300 | | |
| | Post- | 24 | 3.2333 | 0.9187 | | |
| | Gains | | 0.8542 | 0.7819 | 5.32596 | .002 |

* Pre-test score subtracted from Post-test score.
** Level of significance on two-tailed test.

TABLE VIII (Continued)

Mean Pre-Test, Post-test, and Gains Scores on Motor Tasks

| Test | | N | Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|---|
| Throwing and Catching Ball | Pre- | 26 | 3.4038 | 0.8428 | | |
| | Post- | 26 | 3.4836 | 0.8582 | | |
| | *Gains | | 0.0808 | 0.8276 | 0.55452 | N.S. |
| Bouncing Ball Right Hand | Pre | 26 | 1.8538 | 1.1420 | | |
| | Post | 26 | 3.0461 | 1.1132 | | |
| | Gains | | 1.1923 | 1.0859 | 5.58807 | .002 |
| Bouncing Ball Left Hand | Pre- | 25 | 1.9880 | 0.9310 | | |
| | Post- | 25 | 2.9840 | 1.1253 | | |
| | Gains | | 1.2960 | 0.9149 | 7.10443 | .002 |
| Bouncing Ball Both Hands | Pre- | 26 | 1.8615 | 1.0488 | | |
| | Post- | 26 | 2.8961 | 0.9297 | | |
| | Gains | | 1.0346 | 0.8813 | 5.99504 | .002 |

* Pre-test score subtracted from post-test score.
** Level of significance on two-tailed test.

Statistics on Body Image Test

Table IX, page 37, presents the pre-test, post-test, and gains scores, the standard deviations of those scores and the "t" ratios of the Body Image Test.

Inspection of Table IX reveals gains at high levels of significance for identification of shoulders, hips, elbows and for the total score. Gains for identification of head, ears, eyes and mouth were not possible because perfect pre-test scores of. Mean gains in the identification of ankles and feet were positive but not to the extent of significance at the .05 level

TABLE IX

Mean Pre-test, Post-test and Gains Scores in Body Image Test

| Body-Feature | | N | Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|---|
| Shoulders | Pre- | 27 | 2.3333 | 0.9198 | | |
| | Post- | 27 | 3.0000 | 0.0000 | | |
| | *Gains | | 0.6663 | 0.9198 | 3.7847 | .002 |
| Hips | Pre- | 27 | 1.3333 | 0.7338 | | |
| | Post- | 27 | 2.4074 | 0.8883 | | |
| | Gains | | 1.0741 | 0.9578 | 5.8047 | .002 |
| Head | Pre- | 27 | 3.0000 | 0.0000 | | |
| | Post- | 27 | 3.0000 | 0.0000 | | |
| | Gains | | 0.0000 | 0.0000 | | N.S. |
| Ankles | Pre- | 27 | 1.5185 | 0.8931 | | |
| | Post- | 27 | 2.6666 | 0.6201 | | |
| | Gains | | 1.1481 | 0.9087 | 0.8589 | N.S. |
| Ears | Pre- | 27 | 3.0000 | 0.0000 | | |
| | Post- | 27 | 3.0000 | 0.0000 | | |
| | Gains | | 0.0000 | 0.0000 | 0.0000 | N.S. |
| Elbows | Pre- | 27 | 2.0741 | 0.9578 | | |
| | Post- | 27 | 2.8148 | 0.5572 | | |
| | Gains | | 0.7407 | 1.0594 | 3.6293 | .002 |
| Eyes | Pre- | 27 | 3.0000 | 0.0000 | | |
| | Post- | 27 | 3.0000 | 0.0000 | | |
| | Gains | | 0.0000 | 0.0000 | 0.0000 | N.S. |
| Feet | Pre- | 27 | 2.8519 | 0.5337 | | |
| | Post- | 27 | 2.9630 | 0.1923 | | |
| | Gains | | 0.1111 | 0.5774 | 0.9899 | N.S. |
| Mouth | Pre- | 27 | 3.0000 | 0.0000 | | |
| | Post- | 27 | 3.0000 | 0.0000 | | |
| | Gains | | 0.0000 | 0.0000 | 0.0000 | N.S. |
| Total | Pre- | 27 | 22.1111 | 2.3912 | | |
| | Post- | 27 | 25.8518 | 1.4061 | | |
| | Gains | | 3.7407 | 2.5344 | 7.5679 | .002 |

* Pre-test score subtracted from Post-test score
** Level of significance on two-tailed test.

# CHAPTER IV

## SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

In order to increase the probability of arriving at valid conclusions in the absence of a control group it was possible in arriving at gains scores with the Wechsler Preschool and Primary Scale of Intelligence, to utilize scaled scores, which to a large degree compensate for increase in chronological age. The Scaled scores are the result of raw scores being converted to a scale with a mean of 10 and these scores are based on a given child's age group. The scaled score represents the child's standing relative to the children in the standardization sample. Increase in the scaled score from pre-to mid- or post-testing, therefore, is a gain beyond the normal development correlated with chronological age. In similar fashion the scores used to compute gains on the Frostig Developmental Test of Visual Perception were the scale scores derived from the conversion tables provided by the test manual. All determinations of statistical significance of gains scores were made on the rigorous basis of two-tailed tests of significance.

A number of conclusions appear valid:

1. Perceptual handicaps can be detected at a preschool level with considerable accuracy. The observed persistency of these problems over an extended period of time offered

convincing confirmation. It might be argued that many children evidencing early perceptual confusions naturally grow out of them in time. The fact is that if children were chosen at random, an estimated 10% to 15% of them would fail to develop to the point where they could perform academically on an acceptable level. The children involved in this present research were revealed through careful screening to show extreme evidence of underdevelopment in perceptual functions. It seems safe to say that the substantial majority of them would later be considered learning disabled.

2. The first areas of performance to show significant gain were Geometric Design and Picture Completion as found in the Wechsler Preschool and Primary Scale of Intelligence. Although only 4 areas were tested at mid-term, gain in these areas may be indicative of a productive theoretical framework for remediation. The author of the Wechsler Scale indicates concerning the Geometric Design subtest that "the abilities measured by the test depend primarily on perceptual and visual-motor organization." Likewise, the subtest of Picture Completion taps the function of perceptual awareness.

3. The remediation techniques used were associated more with gains in the Performance area than gains in the Verbal area as indicated by the Wechsler Preschool and Primary Scale of Intelligence. The only significant change in the verbal area was in Arithmetic which showed positive gain from pre- to post-testing. The author indicates that this subtest is

"...designed to measure basic quantitative concepts without involving explicit use of numbers."[1] With the exception of Vocabulary (which showed a non-significant decrease) other verbal subtest scores showed change in a positive direction but to a degree less than statistical significance. With the exception of the gains score on the Animal House subtest (which was positive but non-significant) all Performance subtest gains scores were positive and highly significant. This superiority of gain on the performance subtests tends to confirm the effectiveness of the remediation techniques in developing functional perceptual ability. The Block Design subtest is described by the author as "...a sorting as well as a perceptual motor test."[2] The Mazes subtest involves spatial orientation. It is of interest that, positive but non-significant change occurred in the gains score on the Animal House subtest which is described by the author as requiring"...the child to associate sign with symbol."[3] and furtner stating "Memory is, of course, a basic factor, but attention span, goal awareness and ability to concentrate may also be involved."[4]

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[1] Wechsler, David. Manual: Wechsler Preschool and Primary Scale of Intelligence. New York: The Psychological Corporation, 1967, p. 9.

[2] Ibid. p. 10.

[3] Ibid., p. 11.

[4] Ibid., p. 11.

The overall Verbal gains score was positive but non-significant, the overall Performance gains score was highly significant, and the Full Scale gains score was highly significant. Thus it is evident that mental functioning is substantially improved by the use of these techniques.

5. Significant positive gain in the ability of visual perception is associated with the specified remediation technique employed. Gains in figure-ground perception and the perception of form constancy were positive at a high level of significance.

6. Motor skills and body image showed highly significant positive development, but the extent to which the remediation techniques were associated with these gains cannot be ascertained in the absence of a control or normative group. Highly complex motor skills such as jumping rope and throwing and catching a ball appear to develop more slowly as evidenced by the fact that on these skills gains were positive but not to the level of significance.

7. Basic to the ultimate effectiveness of the technical training in all areas was the therapeutic quality of the relationship between each staff member and each child. Expectation, persuasion, opportunity, the absence of coercion, and constant effort to help each child meet his needs developed a depth of relationship between the children and the staff that slowly but steadily brought order out of chaos. Only in the case of a child endangering the safety of another or himself would

a staff member physically intervene and then the practice was to envelop an uncontrolled child in his arms restraining him with firmness, yet gentleness. It was a highly regarded rule never to threaten or coerce a child. It was incumbent upon a staff member not only to show patience, but to develop a quality of relationship with a child that led to cooperation. From chaotic and frustrating beginnings it was as though children and staff members learned together acquiring an uncommon depth of loyalty that emerged very subtly in the midst of stress and ever-present failure. In the most extreme cases referral to local pediatricians led to the prescription of medication, usually ritalin. In every case distractability and hyperkinesis began to subside. Greater impulse control and some of the first signs of gentleness appeared. It was the shared aspiration of the staff never to tell a child that he was wrong, instead trying to arrange the elements of his experience in such a way that the child could discover his error for himself.

The constant contact of the parent education specialist with the parent and the trust in which she was held by parents resulted in parental responsiveness to suggestion and to excellent attendance at parent meetings where there was professional lecture and informal discussion dealing with homelife and childrearing. The close communication and cooperation that developed with the staff members of Child and Family Service enabled a concerted

approach to the inclusive and interdependent problems of the family to be made. Finally, the eager cooperation of school and welfare personnel aided in stabilizing the conditions necessary for the successful adjustment of these children.

Appendix A

EXPERIMENTAL LEARNING PROGRAM

for Preschool Children in
the Model Cities Area

For over-active children who have
difficulty paying attention
For information call:
784-8441 (9:00 a.m. - 12:00 noon)
782-3860 (afternoons, evenings and
weekends)
Leland Bechtel, Project Director

Appendix B

TO: Radio Stations WPNO, WCOU, AND WLAM

FROM: Leland Bechtel, Project Director
Learning Center
Park Hill Avenue
Auburn, Maine

Please make the following free public service announcement during the month of August.

Special Preschool Program for Model Cities Children

If you have a normally bright 4 or 5-year-old child who just can't sit still or pay attention, who seems to get into more than his share of trouble, yet who seems to try so very hard; you might want to have him considered for the federally supported Experimental Learning Program.

At no expense to you, a kind sympathetic, highly qualified staff will train your child by means of some of the most advanced techniques employed in education. When he enters school, your child will receive special tutorial help and attention, and his progress will be carefully followed by a professional staff.

This program for 4 and 5 year-old children will run from this September to next April with sessions being held at the Learning Center, Park Hill Avenue, Auburn, Maine.

For information call: 784-8441 (9:00 - 12:00)

Appendix C

SPECIAL PRESCHOOL PROGRAM

FOR MODEL CITIES CHILDREN
(4-5 Year-olds)

Thirty four and five year old Model Cities children will be selected for this federally supported experimental program that will run from September, 1971 to April, 1972. This program is especially designed for highly active, normally bright children.

We will give your child these unusual advantages:

1) We will discover how your child learns best by making use of special educational tests and trained individualized observation.

2) Then, we will train your child by means of some of the most advanced techniques yet employed in education.

3) When your child enters school, we will provide a specially trained tutor for him teaching him by means of methods that we have discovered work well with him.

4) We will be in conference with your child's regular school teachers sharing our learning discoveries so that your child's maximum progress will continue throughout the school year.

5) We will share all our information with you, his parents, so that you may be able to best help him at home.

To have your child considered for this program call:

784-8441 (Daytime)

782-3860 (Evenings and Weekends)

THE LEARNING DISABILITY PROGRAM
ANDROSCOGGIN COUNTY TASK FORCE ON SOCIAL WELFARE, INC.
Park Hill Avenue
Auburn, Maine

Project Director - Leland P. Bechtel, PhD.
Assistant Project Director - David R. Magnussen, B.A.

Appendix D

P-M TASKS

Name _____ Test (Pre- or Post-) _____

Rater _____ Date _____

| | Excellent 5 | Good 4 | Fair 3 | Poor 2 | Cannot Perform Task 1 |
|---|---|---|---|---|---|
| 1) Jumping Rope | | | | | |
| 2) Bouncing Ball | | | | | |
| Right Hand | | | | | |
| Left Hand | | | | | |
| Both Hands | | | | | |
| 3) Throwing and Catching Ball | | | | | |
| 4) Balance Beam | | | | | |
| Forwards | | | | | |
| Backwards | | | | | |
| Sideways | | | | | |
| 5) Skipping | | | | | |
| 6) Hopping | | | | | |
| Right Foot | | | | | |
| Left Foot | | | | | |

| 5 Excellent | 4 Good | 3 Fair | 2 Poor | 1 Cannot Perform Task |
|---|---|---|---|---|

Appendix E

Date _____ Name _____

Pre-test
Post-test

Birthdate _____
Age _____
Yrs. Mos.

Score _____

IDENTIFICATION OF BODY PARTS

| | 1 "Feels Around" (Inaccurate) | 2 Hesitant (Accurate) | 3 Decisive (Accurate) | Pair Indicated |
|---|---|---|---|---|
| Shoulders | | | | |
| Hips | | | | |
| Head | | | | |
| Ankles | | | | |
| Ears | | | | |
| Elbows | | | | |
| Eyes | | | | |
| Feet | | | | |
| Mouth | | | | |

Comments:

Examiner _____

Part II

Summer Program

(Elementary School Pupils)

July - August, 1972

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# CHAPTER I

# THE PROBLEM

## The Statement of the Problem

This research evaluated the effects of methods of remediation of learning disabilities in elementary school children upon perceptual-motor ability, certain aspects of intellectual functioning and performance in specified areas of learning.

## Basic Hypothesis

It was hypothesized that an experimental group of elementary school children, diagnosed as perceptually disabled (dyslexic) on the basis of careful screening procedures and subjected to intense remediation procedures in a six-week summer program and a control group similarly diagnosed as perceptually disabled would be significantly differentiated at the close of the experiment in perceptual-motor ability, certain aspects of intellectual functioning and specified areas of learning and that the experimental group would be significantly more affected in these areas than would the control group.

## The Need for the Study

The salient features of the whole dyslexic problem have been described in Part I under this same heading. While the prognosis for early detection and remediation has been generally favorable, the success of remediation attempts has diminished sharply with increasing age. Due to the large numbers of perceptually impaired children who constantly suffer academic failure and consequently

grow deeply discouraged and often hostile, means must be found to reconstruct the perceptual, integrative and response systems of these children and put them on the road to academic progress. This research is aimed at testing the effectiveness of remediation procedures with those children who are already painfully frustrated and deeply discouraged.

By and large, the only recipients of attempts at remediation have been children of privileged, wealthy families because of the prohibitive costs of low pupil-teacher ratio pioneering rehabilitative programs. This present research is an attempt to test the effects of certain remedial procedures upon the responses of children of elementary school age who face the additional hardships of being culturally disadvantaged.

CHAPTER II

PROCEDURE IN COLLECTING DATA

The Setting

The data for this research was derived mostly from elementary school children residing in the Model Cities vicinity of Lewiston, Maine. The more than 1500 children between the ages of 5 years and 14 years who reside in the Model Cities area provided the pool of children from which 40 subjects with pronounced dyslexic tendencies were selected. The primary means of locating children for initial screening was through referrals from the elementary school principals of the five schools in the area. The teachers of these schools have become sufficiently well informed to recognize cases of perceptual disablement with a high degree of accuracy. Through observational visits to the summer program of the previous year, through teacher workshops featuring speakers on learning disabilities (including the director of this present project), and through growing information programs on both local and national levels, teachers have become far more sensitive to the needs of dyslexic children than ever before. Further publicity was gained through newspaper ads, public service announcements on the three local radio stations, and mimeographed flyers distributed through the city Health nurses, the Model Cities Office and low income meeting places.

The remedial training program was conducted at the Pettengill Elementary School, Lelwiston, Maine, made available by the unusually helpful Superintendent of Schools. This well-equipped,

spacious school with a gymnasium and other athletic facilities was adequate for the needs of the program. The constant assistance of the school principal, the provision of janatorial personnel, and the cooperative nature of the secretarial personnel facilitated the effective operation of the program. The space utilization was as follows:

Tutorial rooms
Math class room
English composition room
Perceptual-motor training room
Gross motor training room
Outside play area
Dining area
Kitchen
Office

Research Populations

Forty elementary school children with an average age of 10.29 years were selected on the basis of extensive diagnostic screening as sufficiently perceptually disabled for inclusion in the remedial program. It was seldom possible to have N=40 for any one test because of the difficulty of testing many of these children. Their initial uncooperativeness, their inability to attend in a sustained manner, and their unwillingness or inability to follow directions made the acquisition of data very difficult. However, in every case wherein data could be obtained the data was included in this analysis.

Materials and Evaluative Devices

The following evaluative devices were used as indicated:

| | |
|---|---|
| Wechsler Intelligence Scale for Children | (Initial Screening) |
| Slingerland Screening Tests for Identifying Children with Specific Language Disability | (Initial Screening plus pre- and post-testing) |
| Frostig Developmental Test of Visual Perception | (Initial Screening plus pre- and post-testing) |
| Metropolitan Reading Tests | (Pre- and Post-testing) |
| Metropolitan Arithmetic Test | (Pre- and post-testing) |
| Gilmore Oral Reading Test | (Pre- and post-testing) |
| Tests of Motor Tasks | (Pre- and post-testing) |

The above tests were administered by three trained testers in conjunction with consultants who assisted in the analysis of test data and advised in test interpretation. The decision to enroll a child in the program was made by project director following a diagnostic council meeting wherein data from the tests administered the previous day was presented and carefully analyzed.

Testing for screening purposes was done at the Learning Center beginning on the first Saturday in May and continuing on Saturdays until mid-June. Following the end of the school term testing was done 5 days weekly through the first week in July. Screening was accomplished in approximately 4 full weeks of work.

Wechsler Intelligence Scale for Children

The WISC is a distinct test from the Wechsler Adult Intelligence Scale and is preferred in testing adolescents up through the age of 15 years. This test yields a deviation I.Q. which is based on a comparison each subject's test performance with the scores

earned by individuals in his age group. An I.Q. of 100 is set equal to the mean total score for each age, and the standard deviation is set equal to 15 points. The WISC consists of 12 subtests divided into two equal subgroups identified as Verbal and Performance. The reliability coefficients computed by the split-half technique for children aged 10½ years are as follows: Verbal Score, .96; Performance score, .89; and Full Scale score, .95.

This test was used to assess the general intellectual level of the child to determine if he qualified intellectually for admission to the program, and it was used diagnostically as an indicator of dyslexic symptoms on the basis of certain typical patterns of response.

Slingerland Screening Tests for Identifying Children with Specific Language Disability

This test was administered individually to each child to discover weaknesses in visual, auditory, and kinesthetic functioning. The authors indicate that "the purpose of the Screening Tests is to screen from among a group of children those with potential language difficulties and those with already present specific language disabilities who are in need of special attention at the moment."[1] These tests appear in three sets continuing to the 4th grade but may be used with individuals beyond the given grade levels. The

[1]Slingerland, Beth. Teacher's Manual to accompany Slingerland Screening Tests for Identifying Children with Specific Language Disability. Cambridge: Educators Publishing Service, Inc., 1970, p. xx.

author indicates that "...they may be used for comparative purposes to measure gains after remediation."[1]

Frostig Developmental Test of Visual Perception

This test is described in Part I of this report under the same heading.

Metropolitan Reading Tests

The author's describe the purpose of this test as "...to afford dependable data concerning the level of pupil achievement in word knowledge and reading."[2] This test was administered to pupils in small groups. Scoring was in terms of raw scores, standard scores, stanines, grade equivalents, and percentile rank. The tabular presentations in this report contain raw scores. The authors indicate that an important use of the test is"...to compare present achievement with past achievement in order to determine and evaluate progress."[3]

Metropolitan Arithmetic Test

This test presents data concerning the level of achievement in arithmetic computation and arithmetic problem solving and concepts. This test was administered to pupils in small groups. Scoring was in terms of raw scores, standard scores, stanines, and grade equivalents. The tabular presentations in this report are in terms of raw scores. The reliability coefficient of the

[1] Ibid., p. 3.

[2] Directions for Administering Metropolitan Achievement Tests. Walter N. Durast, Editor. New York: Harcourt, Brace and World, Inc., 1969, p. 7.

[3] Ibid., p. 3.

arithmetic computation subtest is .92 and of the arithmetic problem solving and concepts subtest is .88.

Gilmore Oral Reading Test

This individually administered test provides measures of accuracy of oral reading, comprehension of material read, and rate of reading. It has two equivalent forms, C and D and has levels for pupils in grades 1 through 8. Each form presents 10 oral reading paragraphs which form a continuous story with illustrations of characters and events in the paragraphs, and five comprehension questions for each paragraph. For purposes of this research trained testers recorded each pupil's responses on cassette tape and scored the test from the recording. Thus accuracy of scoring as well as permanence of record could be assured. Alternate forms were administered pre- and post-. The test is interpreted in terms of raw scores, stanines, grade equivalents and ratings. The tabular presentations of this report are in terms of raw scores.

Test of Motor Tasks[1]

This test required the performance of the following physical tasks which were rated by the tester on a5-point scale: balance beam forwards, backwards, and sideways; balance board; skipping; and hopping. The ocular pursuits of tracking and convergence were rated on a 3-point scale. Dominance tests were also given for diagnostic purposes but not included in the assessment of progress.

[1] See Appendix A.

Methods of Remediation

The staff consisted of the following members:

1 Project director
1 assistant project director (part-time)
1 Parent education specialist
1 Perceptual-motor specialist
2 Gross motor specialists
2 Teaching aides
13 Reading tutors
1 English composition teacher
1 Math teacher (part-time)
1 Secretary (part-time)
1 cook (part-time)
1 cook-aide (part-time)
4 Drivers (part-time)

2 aides from the Neighborhood Youth Corps

The staff was selected on the basis of experience and effectiveness with this age group of children. One week of training preceded the 6 week program at which time outside consultants were employed to instruct the staff. Most of the reading tutors had prior tutorial experience plus well developed theoretical understandings through a course on learning disabilities offered at Bates College. During the operation of the program, staff meetings were held at the close of each day not only dealing with the material aspects of the program but to discuss the needs of individual children and to plan an integrated approach to the problems of each child.

The program was organized according to the following schedule from Monday to Thursday:

| | |
|---|---|
| 9:00 - 9:50 | 1st period |
| 9:50 -10:40 | 2nd period |
| 10:40 -10:55 | Snack |
| 10:55 -11:45 | 3rd period |
| 11:45 -12:15 | Lunch |
| 12:15 - 1:05 | 4th period |
| 1:05 - 1:55 | 5th period |
| 1:55 - 2:10 | Snack |
| 2:10 - 3:00 | 3rd period |

Fridays were used for outings which provided [illegible] swimming and an opportunity for tutors and other staff members to establish friendly relationships with pupils on a personal as well as academic basis.

So
Each child a schedule was arranged that he had 1 period of individual tutoring in reading in the morning and 1 period of individual tutoring in reading in the afternoon. In addition, there was 1 period of perceptual-motor training, 1 period of gross motor training, 1 period of English composition, and 1 period of math daily.

The individualized tutoring sessions provided instruction in reading skills with primary emphasis upon linguistic and phonic approaches. The Bloomfield-Barnhart Let's Read Series with the accompanying Let's Look workbook were utilized to enable the pupil to learn words by families. The phonic approach of Bloomfield and Timberlake employing a consonant and vowel chart with illustrations of their sounds was used to enable the pupil to learn the sounds of the letters and to practice blending them until recognition of new words could be achieved. The tutors operated within the framework of the principles of remedial instruction [illegible] set forth by N. Dale Bryant.[1]

[1] Bryant, N.Dale "Some Principles of Remedial Instruction for [illegible]" The Reading Teacher, April, 1958, pp. 567-572.

Remediation initially focused on the simplest, most basic perceptual-associational elements in reading. Responses were overlearned until they were automatic. The tutor endeavored to plan the learning experience so that the child was correct in nearly all of his responses. Systematic elimination of interference between discriminations and associations were undertaken in graduated steps. Finally, the tutor utilized frequent reviews of basic perceptual, associational, and blending skills involving actual reading.

The relationship between the child and the tutor was a sensitive one. Interest, acceptance, and approval were essential to the child's progress in learning. It was the task of the tutor to analyze the child's needs and to structure the learning situation so that the child would have his first experiences of success.

The perceptual-motor training was directed by a highly experienced teacher who had taught on levels ranging from K to 12 and was experienced in teaching dyslexic children. She was assisted by a younger teacher's aide. The curriculum included visual, auditory and motor coordination activities. Visual tracking eye exercises were daily provided for children diagnosed as lacking smooth control. Auditory discrimination records were employed to cultivate attending to specific auditory stimuli. A rotating pegboard was used to develop fine muscle coordination and an integrator was used to develop sequencing skill. In addition, drawing activities, games involving counting and puzzles involving

figure-ground perception were utilized. The activities participated in here were always presented within the context of play and were constantly being augmented with new additions. Intense interaction of the teacher and her aide with the pupils was constantly maintained. The teachers participated with the children in everything. The aim here was to enable the child to focus and attend to specific visual and auditory stimuli, to establish eye-muscle coordination, to achieve unity of dominance, and generally to develop fine muscle control. The gross motor training was aimed at developing performances utilizing the large muscle groups which may serve as the foundation for fine muscle coordination such as handwriting. Throwing and catching a basketball, shooting baskets, skipping and balancing were employed. Rhythmic motor activities such as skipping rope, dancing, and the performance of gymnastics were stressed. Finally, techniques of relaxation were regularly utilized to reduce neuro-muscular tension.

English composition class was conducted by a highly skilled male teacher having a record of unusual success with disadvantaged children. He encouraged the telling of stories out of everyday city life, illustrating these experiences with pictures and simple drawings, and then putting the narrative into written form that would be bound along with the pictures into the form of a small book. He steadily cultivated in pupils the ability to compose themes and essays by the progressive development of grammatical construction in linguistic expression. Development of handwriting skills using the materials of Gillingham, Stillman, Dolch, and

others was attempted through carefully planned writing assignments. Exposure of the children to a rich supply of children's literature fostered an interest that led to many of them acquiring public library cards. The children were given access to typewriters and provided with enough instruction to type short themes which they composed. Constant praise and display of the children's work in prominent places in the building heightened motivation. No matter on what level of performance, if a child achieved anything that was a step up, the teacher would rush to the director or some other adult excitedly showing the child's work often within the observation of the child. Many of these pupils probably had not received praise for academic work within their immediate recollection. The teacher imparted a contagion of enthusiasm regarding English composition.

Arithmetic was taught by a male college student who had demonstrated singular effectiveness teaching arithmetic in this program the previous summer. His low-keyed, gentle, but firm manner combined with his brilliant record as a college athlete to make him an inspiring identification figure for pupils in the program. The primary text utilized was the Elementary School Mathematics, series K-6 by Nicholy, et al. (Addison-Wesley Publishing Company, Inc., 1968). Flash cards, multiplication tables, worksheets, and recitation were utilized. The teacher had mastered the art of maintaining constant verbal contact with each child in his

class (never more than 7 children) always recognizing each remark with a constructive response. His class was a virtual dynamic unit of intercommunication from beginning to end. Stray comments were always recognized but redirected to the subject matter at hand without scolding, recrimination, or any element of negativism. He encouraged discovery and understanding of ideas working in drill frequently but for limited periods of time.

# CHAPTER III

## RESULTS: TREATMENT AND INTERPRETATION OF DATA

### Statistics Indicating Comparability of Groups

The assumption that both groups were comparable with regard to sex and age is supported by the data indicated in Table I, page 60. The difference in the composition of the groups in regard to sex is only 4 per cent. The ranges, means and standard deviations of age are closely comparable. The F and "t" ratios indicate no significant difference between the groups in age.

The similarity of the two groups in terms of sex and intelligence is indicated by Table II, page 61, showing Verbal I.Q., Performance I.Q. and Full Scale I.Q., measured on the Wechsler Intelligence Scale for Children. Although direction of differences was in favor of the control group being slightly higher, F and "t" ratios indicate no significant differences between the groups in intelligence.

The similarity of the two groups is further shown by comparisons of pre-test scores on the following tests indicated by the respective tables:

Slingerland Screening Tests, Table III, page 62;
Frostig Developmental Test of Visual Perception, Table IV, page 63;
Metropolitan Reading Tests, Table V, Page 64;
Metropolitan Arithmetic Test, Table VI, page 65;
Gilmore Oral Reading Test, Table VII, page 66; and
Test of Motor Tasks, Table VIII, page 67.

However, since this research is concerned with gains scores, differences between the groups in initial ability would not invalidate a comparison of the groups.

TABLE I

Description and Comparison of the Experimental and Control Groups with Regard to Sex and Age

| | Experimental Group | | Control Group | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| N | 30 | 10 | 19 | 4 |
| Percentage | 75 | 25 | 79 | 21 |
| Age: Mean | 9.94 | 11.07 | 9.92 | 10.22 |
| Range | 5.75-14.83 | 7.92-15.17 | 5.75-12.92 | 7.67-15.33 |
| Mean | 10.50 | 10.29 | 10.07 | |
| S.D. | 1.986 | | 2.558 | |
| F | 1.003 | | | |
| "t" | 0.373* | | | |

*not significant at .05 level of significance

TABLE II

Description and Comparison of the Experimental and Control Groups with Regard to Sex and Intelligence

| | Experimental Group | | Control Group | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| N | 30 | 10 | 15 | 4 |
| Verbal I.Q. | | | | |
| Mean | 90.33 | 79.70 | 91.67 | 93.50 |
| Range | 72-113 | 70-95 | 72-100 | 70-114 |
| Mean | 85.02 | | 92.59 | |
| S.D. | 11.004 | | 13.239 | |
| F | 1.447 | | | |
| "t" | 1.420* | | | |
| Performance I.Q. | | | | |
| Mean | 96.93 | 87.00 | 95.20 | 90.00 |
| Range | 67-118 | 61-111 | 76-118 | 69-111 |
| Mean | 91.97 | | 92.60 | |
| S.D. | 13.945 | | 11.365 | |
| F | 1.506 | | | |
| "t" | 0.094* | | | |
| Full Scale I.Q. | | | | |
| Mean | 92.83 | 81.60 | 92.60 | 91.25 |
| Range | 70-115 | 62-103 | 76-107 | 87-112 |
| Mean | 87.23 | | 91.93 | |
| S.D. | 12.739 | | 12.680 | |
| F | 1.009 | | | |
| "t" | 0.546* | | | |

*not significant at .05 level of significance

TABLE III

Comparison of Pre-test Scores on the Slingerland Screening Tests for Identifying Children with Specific Language Disability

| Test | | N | Mean | Range | S.D. | F |
|---|---|---|---|---|---|---|
| Copying-Chart | E* | 32 | 5.46875 | 1-26 | 5.8253 | 1.7229 |
| | C** | 16 | 4.3125 | 0-13 | 4.4379 | |
| Copying-Page | E | 32 | 1.8125 | 0-10 | 2.7171 | 2.2260 |
| | C | 16 | 1.3750 | 0-7 | 1.8211 | |
| Visual Perception-Memory | E | 32 | 3.1562 | 0-6 | 1.6869 | 1.1245 |
| | C | 16 | 4.0000 | 1-8 | 1.7888 | |
| Visual Discrimination | E | 32 | 2.1875 | 0-6 | 3.6061 | 2.5353 |
| | C | 16 | 3.0625 | 0-7 | 2.2647 | |
| Visual Perception-Memory-Kinesthetic | E | 32 | 7.28125 | 1-14 | 3.4288 | 1.1667 |
| | C | 16 | 9.12500 | 3-15 | 3.7035 | |
| Auditory Recall | E | 32 | 10.3125 | 3-27 | 5.4206 | 1.4667 |
| | C | 16 | 13.1875 | 6-27 | 5.5547 | |
| Auditory Sounds | E | 31 | 6.5000 | 1-16 | 4.0347 | 1.3737 |
| | C | 16 | 6.6875 | 1-14 | 4.7289 | |
| Auditory Association | E | 31 | 4.6375 | 0-10 | 2.7092 | 3.9108 |
| | C | 16 | 5.1875 | 1-13 | 5.3576 | |
| Total Errors | E | 39 | 49.10256 | 12-124 | 23.4773 | 2.0495 |
| | C | 19 | 45.36842 | 23-82 | 16.3782 | |
| Total Errors Plus Self-Corrections and Poor Formations | E | 39 | 74.3333 | 12-137 | 27.1441 | 1.7137 |
| | C | 19 | 51.7894 | 23-107 | 20.7350 | |

* Experimental Group
**Control Group

TABLE IV

Comparison of Pre-test Scores on the Frostig Developmental Test of Visual Perception

| Test | | N | Mean | Range | S.D. | F |
|---|---|---|---|---|---|---|
| Eye-Motor Coordination | E* | 40 | 17.775 | 14-26 | 3.7449 | 1.1015 |
| | C** | 14 | 18.7142 | 13-25 | 3.9307 | |
| Figure Ground | E | 40 | 17.375 | 4-20 | 3.9523 | 12.0498 |
| | C | 14 | 19.2857 | 16-20 | 1.1387 | |
| Form Constancy | E | 40 | 10.800 | 0-17 | 3.6247 | 1.4871 |
| | C | 14 | 11.7142 | 4-15 | 2.9724 | |
| Position in Space | E | 40 | 7.400 | 3-8 | 1.0328 | 1.4707 |
| | C | 14 | 7.4285 | 5-8 | 0.8516 | |
| Spatial Relations | E | 40 | 6.425 | 3-8 | 1.1297 | 1.0159 |
| | C | 14 | 6.7142 | 3-8 | 1.1387 | |
| Total | E | 40 | 59.450 | 29-74 | 10.4561 | 1.1565 |
| | C | 14 | 63.000 | 41-75 | 9.7228 | |

* Experimental Group
**Control Group

TABLE V

Comparison of Pre-test Scores on the Metropolitan Reading Tests

| Test | | N | Mean | Range | S.D. | F |
|---|---|---|---|---|---|---|
| Word Knowledge | E* | 34 | 15.4411 | 1-42 | 7.5123 | 2.7683 |
| | C** | 13 | 21.3076 | 8-46 | 12.4992 | |
| Reading | E | 34 | 15.0588 | 5-34 | 5.7098 | 2.1903 |
| | C | 13 | 17.9230 | 9-35 | 8.4504 | |

* Experimental
** Control Group

TABLE VI

Comparison of Pre-test Scores on the Metropolitan Arithmetic Test

| Test | | N | Mean | Range | S.D. | F |
|---|---|---|---|---|---|---|
| Computation | E* | 35 | 15.7428 | 0-42 | 11.9517 | 1.1658 |
| | C** | 14 | 18.7142 | 0-44 | 12.9045 | |
| Problem Solving & Concepts | E | 28 | 9.8928 | 1-33 | 8.2432 | 1.7127 |
| | C | 12 | 12.5000 | 0-32 | 10.9751 | |

* Experimental Group
** Control Group

TABLE VII

Comparison of Pre-Test Scores on the Gilmore Oral Reading Test

| Test | | N | Mean | Range | S.D. | T |
|---|---|---|---|---|---|---|
| Accuracy | E* | 38 | 10.3157 | 0-42 | 8.2235 | 4.6770 |
| | C** | 18 | 13.9444 | 4-47 | 14.4594 | |
| Comprehension | E | 38 | 15.8684 | 3-29 | 5.5064 | 2.9953 |
| | C | 18 | 17.2777 | 0-40 | 11.2605 | |
| Rate: Words per Minute | E | 37 | 59.8918 | 12-120 | 32.4523 | 1.5535 |
| | C | 14 | 59.5714 | 18-138 | 40.4525 | |

* Experimental Group
** Control Group

TABLE VIII

Comparison of Pre-Test Scores on Motor Tasks

| Task | | N | Mean | Range | S.D. | F |
|---|---|---|---|---|---|---|
| Balance Beam Forwards | E* | 38 | 4.05263 | 1-5 | 1.1437 | 2.8455 |
| | C** | 15 | 4.5333 | 3-5 | 0.7432 | |
| Balance Beam Backwards | E | 38 | 2.42105 | 1-4 | 1.0086 | 1.2894 |
| | C | 15 | 2.9333 | 1-5 | 1.1629 | |
| Balance Beam Sideways | E | 38 | 2.7105 | 1-5 | 0.9838 | 1.0478 |
| | C | 15 | 3.2666 | 2-5 | 0.7611 | |
| Balance Board | E | 38 | 3.34210 | 1-5 | 1.2579 | 1.1915 |
| | C | 15 | 3.6000 | 1-5 | 1.1732 | |
| Skipping | E | 38 | 4.3157 | 1-5 | 1.0620 | 1.1976 |
| | C | 15 | 4.3333 | 2-5 | 0.9759 | |
| Hopping | E | 38 | 4.1578 | 1-5 | 0.9733 | 3.6349 |
| | C | 15 | 4.6000 | 4-5 | 0.5070 | |
| Ocular Pursuits Tracking | E | 38 | 2.0526 | 1-3 | 0.8988 | 1.4341 |
| | C | 14 | 2.42857 | 1-3 | 0.7559 | |
| Convergence | E | 38 | 2.5789 | 1-3 | 0.8683 | 4.0639 |
| | C | 14 | 2.7857 | 2-3 | 0.4257 | |

* Experimental Group
**Control Group

Statistical Procedure

In order to determine the extent of remediation of learning disability in an experimental group and a control group by evaluating each group prior to the training and after the training for perceptual, motor, arithmetical and reading skills, the "t" method for assessing the significance of the differences between correlated means of small samples was used. The following steps were taken:

1. The scores for each measure, pre- and post, were obtained for each S in the group.
2. The difference between pre- and post- scores for each measure was obtained for each S in the group.
3. The means and standard deviations of these means were calculated.

By using the following formula and going into the "t" tables with N-1 degrees of freedom, it was possible to determine whether these differences were significant at the five per cent level of significance:

$$"t" = \frac{Mdi}{\sqrt{\frac{\sum x^2 d}{N(N-1)}}}$$

where Mdi = mean of the N difference of paired observations

xd = deviation of a difference from the mean of the differences.

The means and standard deviations of the differences of each measure indicated the extent to which the training objectives were attained and the measure obtained with the "t" formula indicated whether or not

these differences were significant at the five per cent level of confidence.

In order to make an inter-group comparison of the aforementioned data obtained from the determination of extent of remediation in the experimental group and the extent of remediation in the control group to ascertain the effect of specialized training upon perceptual, motor, arithmetical and reading skills the F test of homogeneity of variance at the five per cent level was used to satisfy the assumption underlying the "t" test:

$$F = \frac{\text{larger variance}}{\text{smaller variance}}$$

$$F = \frac{\dfrac{\sum d_1^2}{N_1 - 1}}{\dfrac{\sum d_2^2}{N_2 - 1}}$$

where $\sum d^2$ = sum of squares of the sample. Thereupon the "t" method for assessing the significance of the differences between uncorrelated means of small samples was used by treating the aforementioned data according to the following formula:

$$"t" = \frac{M_1 - M_2}{\sqrt{\left[\frac{\sum x_1^2 + \sum x_2^2}{N_1 + N_2 - 2}\right]\left[\frac{N_1 + N_2}{N_1 N_2}\right]}}$$

where $M_1$ and $M_2$ are the means in the two samples (here, the means

of the differences in the two samples). $\sum x_1^2$ and $\sum x_2^2$ are the sums of the squares of the two samples deviation of a single score from the means of the defferences). $N_1$ and $N_2$ are the numbers of observations, respectively. Going into the "t" tables with $N_1 + N_2 - 2$ degrees of freedom, it was possible to determine whether these differences were significant at the five per cent level.

Extent of Remediation in Experimental Group

The first problem was to determine the extent of remediation in an experimental group, composed of learning disabled elementary school pupils, by evaluating the group prior to the training and after the training period for perceptual, motor, arithmetical and reading skills.

Statistics on Slingerland Screening Tests

Table IX, page 72, presents the mean pre-test, post-test, and gains scores, the standard deviations of these scores, and the "t" ratios of the experimental group on the Slingerland Screening Tests for Identifying Children with Specific Language Disability.

Examination of Table IX reveals that highly significant gains were made in the following areas of performance:

Copying - chart
Copying - Page
Visual Perception - memory
Visual Discrimination
Auditory association
Total Errors
Total Errors Plus Self-Corrections and Poor Formations

Two areas of performance failed to show significant gains - Visual Perception-Memory-Kinesthetic where positive gain did not achieve statistical significance and Auditory Recall where there was negative gain (increase in errors) but not to the level of statistical significance.

TABLE IX

Mean Pre-test, Post-test, and Gains Scores of the Experimental Group on the Slingerland Screening Tests for Identifying Children with Specific Language Disability

| Test | | N | Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|---|
| Copying-Chart | Pre- | 32 | 5.46875 | 5.8253 | | |
| | Post- | 32 | 3.000 | 3.4541 | | |
| | *Gains | | 2.46875 | 3.525304 | 2.14127 | .05 |
| Copying-Page | Pre- | 32 | 1.8125 | 2.7171 | | |
| | Post- | 32 | 0.7500 | 1.7780 | | |
| | Gains | | 1.0625 | 2.263846 | 2.44879 | .05 |
| Visual Perception-Memory | Pre- | 32 | 3.15625 | 1.6859 | | |
| | Post- | 32 | 2.12500 | 1.8621 | | |
| | Gains | | 1.03125 | 1.768615 | 3.29441 | .01 |
| Visual Discrimination | Pre- | 32 | 2.18750 | 3.6061 | | |
| | Post- | 32 | 1.18750 | 1.4241 | | |
| | Gains | | 1.00000 | 1.481046 | 3.82238 | .002 |
| Visual Perception-Memory-Kinesthetic | Pre- | 32 | 7.28125 | 3.4238 | | |
| | Post- | 32 | 6.5625 | 3.8170 | | |
| | Gains | | 0.71875 | 3.603165 | 1.13037 | N.S. |
| Auditory | Pre- | 32 | 10.31250 | 5.4206 | | |
| | Post- | 32 | 12.28125 | 7.2344 | | |
| | Gains | | -1.96875 | 6.620535 | -1.68325 | N.S. |
| Auditory Sounds | Pre- | 31 | 6.50000 | 4.0347 | | |
| | Post- | 31 | 5.28125 | 4.3653 | | |
| | Gains | | 1.21875 | 3.235119 | 2.09957 | .05 |
| Auditory Association | Pre- | 31 | 4.68750 | 2.7092 | | |
| | Post | 31 | 3.84375 | 2.7626 | | |
| | Gains | | 0.84375 | 1.893066 | 2.47052 | .02 |
| Total Errors | Pre- | 39 | 49.10256 | 23.4473 | | |
| | Post- | 39 | 42.12821 | 25.2900 | | |
| | Gains | | 6.97435 | 15.4723 | 2.81325 | .01 |
| Total Errors Plus Self-Corrections and Poor Formations | Pre- | 39 | 74.33333 | 27.1441 | | |
| | Post- | 39 | 62.05128 | 15.8466 | | |
| | Gains | | 12.28205 | 17.414373 | 4.40375 | .002 |

* Post-test error score subtracted from Pre-test error score

**level of significance on 2-tailed test

Statistics on Frostig Developmental Test of Visual Perception

Table X, page 74, presents the mean pre-test, post-test, and gains scores, the standard deviations of these scores and the "t" ratios in areas of visual perception measured by the 5 Frostig tests.

Examination of Table X reveals that positive changes with a high level of significance occurred in eye-motor coordination, figure ground, form constancy, spatial relations and total test performance. Positive change occurred in perception of position in space but this gain falls short of being significant.

TABLE X

Mean Pre-test, Post-test and Gains Scores of the Experimental Group on the Frostig Developmental Test of Visual Perception

| Test | N | Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|
| Eye-Motor Coordination | Pre- 40 | 17.775 | 3.7449 | | |
| | Post- 40 | 19.250 | 3.3645 | | |
| | *Gains | 1.475 | 2.561913 | 3.65363 | .002 |
| Figure Ground | Pre- 40 | 17.375 | 3.9528 | | |
| | Post- 40 | 18.400 | 3.3497 | | |
| | Gains | 1.025 | 1.860349 | 3.50164 | .002 |
| Form Constancy | Pre- 40 | 10.800 | 3.6247 | | |
| | Post- 40 | 14.075 | 2.5539 | | |
| | Gains | 3.275 | 3.145917 | 6.59411 | .002 |
| Position in Space | Pre- 40 | 7.400 | 1.0323 | | |
| | Post- 40 | 7.575 | 0.8129 | | |
| | Gains | 0.175 | 1.114181 | 1.02174 | N.S. |
| Spatial Relations | Pre- 40 | 6.425 | 1.1297 | | |
| | Post- 40 | 6.850 | 1.4771 | | |
| | Gains | 0.425 | 0.984174 | 2.76327 | .01 |
| Total | Pre- 40 | 59.450 | 10.4561 | | |
| | Post- 40 | 66.125 | 13.4829 | | |
| | Gains | 6.674 | 5.205458 | 8.10395 | .002 |

* Pre-test score subtracted from Post-test score
** on 2-tailed test

## Statistics on Metropolitan Reading Tests

Table XI, page 76, presents the mean pre-test, post-test and gains scores, the standard deviations of these scores and the "t" ratios of performance in word knowledge and reading as measured by the Metropolitan Reading Tests.

Inspection of Table XI reveals that although there were positive changes from pre- to post-testing, the gains in word knowledge and reading were not significant at the .05 level. It should be noted, however, that the gain in reading approached this level of significance.

TABLE XI

Mean Pre-test, Post-test, and Gains Scores of the Experimental Group on the Metropolitan Reading Tests

| Test | N | Mean | S.D. | "t" | **Level of Significance |
|---|---|---|---|---|---|
| Word Knowledge | Pre- 34 | 16.441176 | 7.5123 | | |
| | Post- 34 | 17.205882 | 7.8152 | | |
| | *Gains | 0.764706 | 5.918935 | 0.73983 | N.S. |
| Reading | Pre- 34 | 15.058823 | 5.7098 | | |
| | Post- 34 | 16.382352 | 7.5679 | | |
| | Gains | 1.323529 | 5.929585 | 1.27881 | N.S. |

* Pre-test score subtracted fromPost-test score
** on two-tailed test

## Statistics on Metropolitan Arithmetic Tests

Table XII, page 73, presents the pre-test, post-test, and gains scores, the standard deviations of these scores and the "t" ratios of performance in computation and problem solving and concepts as measured by the Metropolitan Arithmetic Test.

Inspection of Table XII reveals a gain in computation significant at the high level of .002 and a gain in problem solving and concepts highly significant at the .01 level.

TABLE XII

Mean Pre-test, Post-test and Gains Scores of the Experimental Group on the Metropolitan Arithmetic Test

| Test | N | Mean | S.D. | "t" | Significance** |
|---|---|---|---|---|---|
| Computation | Pre- 35 | 15.742857 | 11.9517 | | |
| | Post-35 | 20.085714 | 10.9070 | | |
| | *Gains | 4.342857 | 4.362478 | 5.28039 | .002 |
| Problem Solving & Concepts | Pre- 28 | 9.892857 | 8.2432 | | |
| | Post-28 | 12.035714 | 8.0851 | | |
| | Gains | 2.142857 | 4.079889 | 2.77552 | .01 |

*Pre-test score subtracted from post-test score

** on two-tailed test

Statistics on Gilmore Oral Reading Test

Table XIII, page 80, presents the pre-test, post-test, and gains scores, the standard deviations of these scores and the "t" ratios on the Gilmore Oral Reading Test.

Inspection of Table XIII reveals gains in accuracy significant at the .002 level and gains in comprehension also significant at the .002 level. There was a loss in rate: words per minute, but this loss was not significant at the .05 level.

TABLE XIII

Mean Pre-test, Post-test and Gains Scores of the Experimental Group on the Gilmore Oral Reading Test

| Test | | N | Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|---|
| Accuracy | Pre- | 38 | 10.315789 | 8.2235 | | |
| | Post- | 38 | 16.000000 | 12.7978 | | |
| | *Gains | | 5.684211 | 7.079110 | 4.94608 | .002 |
| Comprehension | Pre- | 38 | 15.868421 | 5.5064 | | |
| | Post- | 38 | 20.842105 | 7.3430 | | |
| | Gains | | 4.973684 | 4.162162 | 7.36086 | .002 |
| Rate: Words per minute | Pre- | 37 | 59.891892 | 32.4523 | | |
| | Post- | 37 | 57.000000 | 30.5777 | | |
| | Gains | | -2.891892 | 17.4256 | -1.00331 | N.S. |

* Pre-test score subtracted from Post-test score
** on 2-tailed test

Statistics on Motor Tasks Tests

Table XIV, page 82, presents the pre-test, post-test and gains scores, the standard deviations of these scores and the "t" ratios on the Motor Tasks Tests.

Examination of Table XIII reveals gains at high levels of significance on all tasks: balance beam (forwards, backwards, and sideways), balance board, skipping, hopping, ocular pursuits (tracking and convergence).

TABLE XIV

Mean Pre-test, Post-test, and Gains Scores of the Experimental Group on Motor Tasks

| Test | N | Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|
| Balance Beam Forwards | Pre- 38 | 4.05263 | 1.1137 | | |
| | Post- 38 | 4.78947 | 0.4741 | | |
| | *Gains | 0.73684 | 1.057355 | 4.31409 | .002 |
| Balance Beam Backwards | Pre- 38 | 2.42105 | 1.0035 | | |
| | Post- 38 | 3.86842 | 1.0697 | | |
| | Gains | 1.44737 | 1.155422 | 7.73606 | .002 |
| Balance Beam Sideways | Pre- 38 | 2.71053 | 0.9838 | | |
| | Post- 38 | 3.92105 | 0.7491 | | |
| | Gains | 1.21052 | 1.017595 | 7.32975 | .002 |
| Balance Board | Pre- 38 | 3.34211 | 1.2579 | | |
| | Post- 38 | 4.63158 | 0.8517 | | |
| | Gains | 1.28947 | 1.333716 | 5.96235 | .002 |
| Skipping | Pre- 38 | 4.31579 | 1.0608 | | |
| | Post- 38 | 4.92105 | 0.2733 | | |
| | Gains | 0.60526 | 1.103763 | 3.35083 | .002 |
| Hopping | Pre- 38 | 4.15789 | 0.9733 | | |
| | Post- 38 | 4.92105 | 0.2733 | | |
| | Gains | 0.76316 | 0.970772 | 4.82500 | .002 |
| Ocular Pursuits Tracking | Pre- 38 | 2.05263 | 0.8988 | | |
| | Post- 38 | 2.94737 | 0.2262 | | |
| | Gains | 0.89474 | 0.8533 | 6.35458 | .002 |
| Convergence | Pre- 38 | 2.57895 | 0.8583 | | |
| | Post- 38 | 2.92105 | 0.4866 | | |
| | Gains | 0.34210 | 0.7453 | 2.81213 | .01 |

* Pre-test score subtracted from Post-test score

** on 2-tailed test

Extent of Remediation in Control Group

The second problem was to determine the extent of remediation in a control group composed of learning disabled elementary school pupils, by evaluating the group prior to the training and after the training period for perceptual, motor, arithmetical and reading skills.

Statistics on Slingerland Screening Tests

Table XV, page 84, presents the mean pre-test, post-test and gains scores, the standard deviations of these scores, and the "t" ratios of the control group on the Slingerland Screening Tests.

Examination of Table XV reveals that no significant gains were made except in the category of visual perception-memory-kinesthetic where the gain was significant at the .02 level. Non-significant negative gains (increase in errors) from pre-to-post-testing occurred in the following categories:

Copying - page
Auditory recall
Auditory sounds
Auditory association and
Total Errors plus Self-corrections and Poor formations

TABLE XV

Mean Pre-test, Post-test, and Gains Scores of the Control Group on the Slingerland Screening Tests for Identifying Children with Specific Language Disability

| Test | N | Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|
| Copying-Chart | Pre- 16 | 4.3125 | 4.4379 | | |
| | Post- 16 | 4.1875 | 3.4874 | | |
| | *Gains | 0.125 | 5.22653 | 0.99492 | N.S. |
| Copying-Page | Pre- 16 | 1.3750 | 1.8211 | | |
| | Post- 16 | 1.8125 | 2.0402 | | |
| | Gains | -0.4375 | 1.63172 | -1.07862 | N.S. |
| Visual Perception-Memory | Pre- 16 | 4.0000 | 1.7888 | | |
| | Post- 16 | 3.375 | 2.1252 | | |
| | Gains | 0.625 | 1.99577 | 1.26266 | N.S. |
| Visual Discrimination | Pre- 16 | 3.0625 | 2.2647 | | |
| | Post- 16 | 2.3125 | 2.0238 | | |
| | Gains | 0.7500 | 1.84391 | 1.62698 | N.S. |
| Visual Perception-Memory-Kinesthetic | Pre- 16 | 9.125 | 3.7035 | | |
| | Post- 16 | 7.000 | 3.1622 | | |
| | Gains | 2.125 | 3.13847 | 2.71469 | .02 |
| Auditory Recall | Pre- 16 | 13.1875 | 6.5547 | | |
| | Post- 16 | 13.2500 | 7.8612 | | |
| | Gains | -0.0625 | 3.53023 | -0.16448 | N.S. |
| Auditory Sounds | Pre- 16 | 6.5875 | 4.7289 | | |
| | Post- 16 | 7.1250 | 4.9648 | | |
| | Gains | -0.4375 | 1.45914 | -1.20617 | N.S. |
| Auditory Association | Pre- 16 | 5.1875 | 5.3576 | | |
| | Post- 16 | 5.2500 | 2.8165 | | |
| | Gains | -0.0625 | 1.94828 | -0.12318 | N.S. |
| Total Errors | Pre- 19 | 45.3684 | 16.3782 | | |
| | Post- 19 | 42.4210 | 20.7505 | | |
| | Gains | 2.9474 | 12.1494 | 1.05838 | N.S. |
| Total Errors Plus Self-Corrections and Poor Formations | Pre- 19 | 51.78947 | 20.7350 | | |
| | Post- 19 | 53.53158 | 27.1420 | | |
| | Gains | -1.68421 | 18.9269 | -0.38691 | N.S. |

* Post-test error score subtracted from Pre-test error score
**on 2-tailed test

Statistics on Frostig Developmental Test of Visual Perception

Table XVI, page 86, presents the mean pre-test, post-test and gains scores, the standard deviations of these scores, and the "t" ratios in 5 areas of visual perception measured by the Frostig Test.

Examination of Table XVI reveals no significant gains in any of the 5 categories. In the areas of figure ground perception and perception of position in space the changes from pre- to post- testing were in a negative direction.

TABLE XVI

Mean Pre-test, Post-test, and Gains Scores of the Control Group on the Frostig Developmental Test of Visual Perception

| Test | N | Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|
| Eye-Motor Coordination | Pre- 14 | 18.714285 | 3.9307 | | |
| | Post-14 | 19.071428 | 2.6736 | | |
| | *Gains | 0.3571428 | 3.38792 | 0.39751 | N.S. |
| Figure Ground | Pre- 14 | 19.285714 | 1.1387 | | |
| | Post-14 | 19.142857 | 1.4046 | | |
| | Gains | -0.142857 | 0.94926 | -0.56183 | N.S. |
| Form Constancy | Pre- 14 | 11.714285 | 2.9724 | | |
| | Post-14 | 12.500000 | 3.0318 | | |
| | Gains | 0.785714 | 1.92868 | 1.53260 | N.S. |
| Position in Space | Pre- 14 | 7.4285714 | 0.8513 | | |
| | Post-14 | 6.9285714 | 1.0523 | | |
| | Gains | -0.5000000 | 1.01902 | -1.83585 | N.S. |
| Spatial Relations | Pre- 14 | 6.7142857 | 1.1387 | | |
| | Post-14 | 6.7142857 | 0.8254 | | |
| | Gains | 0.0000000 | 0.87704 | 0.00000 | N.S. |
| Total | Pre- 16 | 63.000 | 9.7228 | | |
| | Post-16 | 62.750 | 8.4182 | | |
| | Gains | -0.250 | 7.02057 | -0.43871 | N S. |

* Pre-test score subtracted from Post-test score
** on two-tailed test

Statistics on Metropolitan Reading Tests

Table XVII, page 88, presents the mean pre-test, post-test and gains scores, the standard deviation of these scores, and the "t" ratios of performance in word knowledge and reading as measured by the metropolitan reading Tests.

Inspection of Table XVII reveals that there were no significant gains in word knowledge or reading. In the area of word knowledge the change was in a negative direction.

TABLE XVII

Mean Pre-test, Post-test and Gains Scores of the Control Group on the Metropolitan Reading Tests

| Test | N | Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|
| Word Knowledge | Pre- 13 | 21.307692 | 12.4992 | | |
| | Post-13 | 20.538461 | 15.9249 | | |
| | *Gains | -0.769231 | 7.47079 | -0.34952 | N.S. |
| Reading | Pre- 13 | 17.923076 | 8.4504 | | |
| | Post-13 | 18.076923 | 9.8273 | | |
| | Gains | 0.1538461 | 3.85956 | 0.13975 | N.S. |

* Pre-test score subtracted from Post-test score
**on two-tailed test

## Statistics on Metropolitan Arithmetic Tests

Table XVIII, page 90, presents the pre-test, post-test and gains scores, the standard deviations of these scores and the "t" ratios of performances in computation and problem solving and concepts as measured by the Metropolitan Arithmetic Test.

Inspection of Table XVIII reveals no significant changes from pre- to post-testing. In both, the category of computation and category of problem solving and concepts the changes were in a negative direction.

TABLE XVIII

Mean Pre-test, Post-test, and Gains Scores of the Control Group on the Metropolitan Arithmetic Test

| Test | | N | Mean | S.D. | t | Level of Significance** |
|---|---|---|---|---|---|---|
| Computation | Pre- | 14 | 13.714285 | 12.9045 | | |
| | Post- | 14 | 13.000000 | 13.7225 | | |
| | *Gains | | -0.714285 | 3.70920 | -0.71621 | N.S. |
| Problem Solving & Concepts | Pre- | 12 | 12.500000 | 10.9751 | | |
| | Post- | 12 | 12.166666 | 11.2236 | | |
| | Gains | | -0.333333 | 2.22913 | -0.51279 | N.S. |

* Pre-test score subtracted from Post-test score

** on two-tailed test

## Statistics on Gilmore Oral Reading Test

Table XIX, page 92, presents the pre-test, post-test and gains scores, the standard deviations of these scores and the "t" ratios on the Gilmore Oral Reading Test.

Inspection of Table XIX reveals no significant change in accuracy; however, the direction of change was negative. In comprehension there was a gain significant at the .02 level. Change in rate: words per minute was in a negative direction but not at a significant level.

TABLE XIX

Mean Pre-test, Post-test and Gains Scores of the Control Group on the Gilmore Oral Reading Test

| Test | | N | Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|---|
| Accuracy | Pre- | 18 | 13.9444 | 14.4594 | | |
| | Post- | 18 | 13.0555 | 16.6961 | | |
| | *Gains | | -0.8888 | 5.67646 | -0.66519 | N.S. |
| Comprehension | Pre- | 18 | 17.2777 | 11.2605 | | |
| | Post- | 18 | 19.9444 | 11.5093 | | |
| | Gains | | 2.6666 | 4.32502 | 2.61914 | .02 |
| Rate: Words Per Minute | Pre- | 14 | 59.5714 | 40.4526 | | |
| | Post- | 14 | 58.9286 | 44.7083 | | |
| | Gains | | -0.6426 | 14.1617 | -0.16909 | N.S. |

* Pre-test score subtracted from Post-test score
** on 2-tailed test

Statistics on Motor Tasks Tests

Table XX, page 94, presents the pre-test, post-test and gains scores, the standard deviations of these scores and the "t" ratios on the Motor Tasks Tests.

Examination of Table XX reveals no sigtificant gains on any tasks. Performance on the balance beam (forwards and backwards) as well as skipping and hopping indicated changes in a negative direction but not to a significant degree.

TABLE XX

Mean Pre-test, Post-test, and Gains Scores of the Control Group on Motor Tasks

| Test | N | Mean | S.D. | "t" | Level of Significance** |
|---|---|---|---|---|---|
| Balance Beam Forwards | Pre- 15 | 4.5333 | 0.7432 | | |
| | Post-15 | 4.3333 | 1.1125 | | |
| | *Gains | -0.2000 | 0.87829 | -0.88192 | N.S. |
| Balance Beam Backwards | Pre- 15 | 2.9333 | 1.1126 | | |
| | Post-15 | 2.8666 | 1.1405 | | |
| | Gains | -0.0666 | 0.70374 | -0.38524 | N.S. |
| Balance Beam Sideways | Pre- 15 | 3.2666 | 0.9611 | | |
| | Post-15 | 3.3333 | 1.2344 | | |
| | Gains | 0.0666 | 1.34198 | 0.20202 | N.S. |
| Balance Board | Pre- 15 | 3.8000 | 1.3732 | | |
| | Post-15 | 3.9333 | 1.0328 | | |
| | Gains | 0.1333 | 1.59759 | 0.31515 | N.S. |
| Skipping | Pre- 15 | 4.3333 | 0.9759 | | |
| | Post-15 | 4.2000 | 0.7745 | | |
| | Gains | -0.1333 | 1.24591 | -0.43089 | N.S. |
| Hopping | Pre- 15 | 4.6000 | 0.5070 | | |
| | Post-15 | 4.2000 | 0.7745 | | |
| | Gains | -0.4000 | 0.91026 | -1.70193 | N.S. |
| Ocular Pursuits Tracking | Pre- 14 | 2.4286 | 0.7559 | | |
| | Post-14 | 2.6429 | 0.4972 | | |
| | Gains | 0.2143 | 0.5789 | 1.35719 | N.S. |
| Convergence | Pre- 14 | 2.7857 | 0.4257 | | |
| | Post-14 | 2.9286 | 0.2672 | | |
| | Gains | 0.1429 | 0.3631 | 1.44247 | N.S. |

* Pre-test score subtracted from Post-test score
** on two-tailed test

Inter-group Comparison of Extent of Remediation

It was hypothesized that the experimental and control groups would be significantly differentiated at the close of the experiment in perceptual, motor, arithmetical, and reading skills and that the experimental group would be significantly more affected in these areas than would be the control group.

Table XXI, page 96, presents the inter-group differences with respect to mean gains scores on the Slingerland Screening Tests for Identifying Children with Specific Language Disability.

Examination of Table XXI reveals that the experimental group trained with special methods of remediation made a larger gain than the control group in terms of reduction of total errors plus self-corrections and poor formations on the Slingerland Screening Tests and this difference is highly significant at the .01 level, on the copying-page subtest the experimental group made a greater gain than the control group and the difference between the groups was significant at the .05 level. On the remaining subtests, with the exceptions of visual perception-memory-kinesthetic and auditory recall, the experimental group made larger gains than the control group but the differences between the groups were not significant at the .05 level. In the aforementioned categories of visual perception-memory-kinesthetic and auditory recall the control group made larger gains than the experimental group but the differences between groups were not significant at the .05 level.

TABLE XXI

Intergroup Differences of Mean Gains Scores in the Slingerland Screening Tests for Identifying Children with Specific Language Disability

| Test | Mean E-C* | F | Level of Significance | "t" | Level of Significance |
|---|---|---|---|---|---|
| Copying-chart | 2.34 | 1.5587 | N.S. | 1.24629 | N.S. |
| Copying-Page | 1.50 | 2.2519 | N.S. | 2.21111 | .05 |
| Visual Perception-Memory | 0.40 | 1.2733 | N.S. | 0.70778 | N.S. |
| Visual Discrimination | 0.25 | 1.5500 | N.S. | 0.50764 | N.S. |
| Visual Perception-Memory-Kinesthetic | -1.41 | 1.3180 | N.S. | -1.33151 | N.S. |
| Auditory Recall | -2.03 | 3.5170 | .02 | -1.14559 | N.S. |
| Auditory Sounds | 1.63 | 4.7571 | .02 | 1.94500 | .1 |
| Auditory Association | 0.90 | 1.0944 | N.S. | 1.52940 | N.S. |
| Total Errors | 4.02 | 1.6218 | N.S. | 0.99179 | N.S. |
| Total Errors Plus Self-Corrections and Poor Formations | 13.96 | 1.1812 | N.S. | 2.78533 | .01 |

* Mean gains scores of Control Group Subtracted from same scores of the Experimental Group

Table XXII presents the inter-group differences with respect to mean gains scores on the Frostig Developmental Test of Visual Perception, the F ratios and the "t" ratios.

Examination of Table XXII reveals the experimental group made a larger gain than the control group on the total score and this gain is highly significant at the .002 level. On the 5 subtests the experimental group made greater gains than the control group and the differences between groups were highly significant at the .002 level for figure ground perception. The differences between groups were not significant at the .05 level for eye-motor coordination, position in space and spatial relations.

TABLE XXII

Intergroup Differences of Mean Gains Scores on the Frostig Developmental Test of Visual Perception

| Test | Mean E-C* | F | Level of Significance | "t" | Level Significance |
|---|---|---|---|---|---|
| Eye-Motor Coordination | 1.12 | 5.7182 | .02 | 1.29207 | N.S. |
| Figure Ground | 1.17 | 3.8407 | .02 | 2.24328 | .05 |
| Form Constancy | 2.49 | 2.505 | N.S. | 2.7451 | .01 |
| Position in Space | 0.53 | 1.1954 | N.S. | 2.00681 | .1 |
| Spatial Relations | 0.43 | 1.2592 | N.S. | 1.44465 | N.S. |
| Total | 7.44 | 1.8189 | N.S. | 4.01719 | .002 |

* Mean gains scores of Control Group subtracted from same scores of the Experimental Group

Table XXIII, page 99, presents the inter-group differences of mean gains scores on the Metropolitan Reading Tests, the F ratios and the "t" ratio.

Inspection of Table XXIII reveals greater gains in word knowledge and reading were made by the experimental group but not at the level of significance.

In the opinion of the testers, the pupils characteristically reacted to multiple-choice questions with guessing. They seemed unable to resist the temptation to follow their prior mode of response of putting check marks in little squares without reading the alternatives.

TABLE XXIII

Intergroup Differences of Mean Gains Scores on the Metropolitan Reading Tests

| Test | Mean E-C* | F | Level of Significance | "t" | Level of Significance |
|---|---|---|---|---|---|
| Word Knowledge | 1.53 | 1.7993 | N.S. | 0.70819 | N.S. |
| Reading | 1.17 | 2.4191 | N.S. | 0.53421 | N.S. |

* Mean gains scores of Control Group subtracted from same scores of the Experimental Group

Table XXIV presents the inter-group differences with respect to mean gains scores on the Metropolitan Arithmetic Test, the F ratios and the "t" ratios.

Inspection of Table XXIV reveals the experimental group achieved greater gains than the control group in arithmetical computation and the difference between groups is highly significant at the .002 level. Greater gains were attained by the experimental group in problem solving and concepts but the difference between groups although approaching significance at the .05 level was significant only at the .10 level.

TABLE XXIV

Intergroup Differences of Mean Gains Scores on the Metropolitan Arithmetic Test

| Test | Mean E-C* | F | Level of Significance | "t" | Level of Significance |
|---|---|---|---|---|---|
| Computation | 5.05 | 1.7185 | N.S. | 3.49237 | .002 |
| Problem Solving & Concepts | 2.47 | 3.3493 | N.S. | 1.96549 | .1 |

* Mean Gains scores of Control Group subtracted from same scores of the Experimental Group

Table XXV, page 104, presents the inter-group differences with respect to mean gains scores on the Gilmore Oral Reading Test, the F ratios and the "t" ratios.

Inspection of Table XXV reveals that a greater gain was made by the experimental group in accuracy and that the difference between groups is highly significant at the .002 level. The experimental group made a greater gain than the control group in comprehension but the difference between groups is not significant at the .05 level although approaching it with significance at the .10 level. The experimental group lost more than the control group in rate: words per minute but the difference between groups was not significant at the .05 level. It seems likely that as pupils increased in accuracy they read more carefully and thus more slowly.

TABLE XXV

Intergroup Differences of Mean Gains Scores on the Gilmore Oral Reading Test

| Test | Mean E-C* | F | Level of Significance | "t" | Level of Significance |
|---|---|---|---|---|---|
| Accuracy | 3.57 | 1.5552 | N.S. | 3.44279 | .002 |
| Comprehension | 2.30 | 1.0797 | N.S. | 1.90746 | .1 |
| Rate: Words per minute | -2.25 | 1.5141 | N.S. | -0.43139 | N.S. |

* Mean gains scores of Control Group subtracted from same scores of the Experimental Group

Table XXVI, page 104, presents the inter-group differences of mean gain scores on the test of Motor Tasks, the F ratios and the "t" ratios.

Examination of Table XXVI reveals that the experimental group made greater gains than the control group on all tasks and the differences between groups achieved high levels of significance in all tasks except ocular convergence which was not significant at the .05 level.

TABLE XXVI

Intergroup Differences of Mean Gains Scores on Motor Tasks

| Test | Mean E-C* | F | Level of Significance | t" | Level of Significance |
|---|---|---|---|---|---|
| Balance Beam Forwards | 0.94 | 1.4493 | N.S. | 3.04795 | .01 |
| Balance Beam Backwards | 1.52 | 2.5953 | N.S. | 4.74312 | .002 |
| Balance Beam Sideways | 1.14 | 1.7391 | N.S. | 3.34937 | .002 |
| Balance Board | 1.15 | 1.4348 | N.S. | 2.59590 | .01 |
| Skipping | 0.73 | 1.2741 | N.S. | 2.09153 | .05 |
| Hopping | 1.16 | 1.1374 | N.S. | 3.98531 | .002 |
| Ocular Pursuits Tracking | 0.53 | 2.2237 | N.S. | 2.72145 | .01 |
| Convergence | 0.20 | 4.2115 | .02 | 0.95859 | N.S. |

* Mean gains scores of Control Group subtracted from same scores of the Experimental Group

The intergroup differences are conveniently summarized in Table XVII, page 108, Table XXVIII, page 109 and Table XXIX, page 110, concerning which the following observations may be made.

1. Out of 31 possible test scores the experimental group made 23 positive gains, 25 of which were significant. Two scores were non-significant negative gains.
2. Out of 31 possible test scores the control group made 14 positive gains, 2 of which were significant. Seventeen scores were non-significant negative gains.
3. An intergroup comparison showed the experimental group with 28 positive gains over the control group, 14 of which were significant. Three scores were non-significant negative gains.

TABLE XXVII

Summary of Test Gains Favoring the Experimental Group with Significant Inter-group Differences

| Test | Level of Significance |
|---|---|
| Slingerland Screening Tests | |
| Copying-Page | .05 |
| Auditory Sounds | .10* |
| Total Errors Plus Self-Corrections and Poor Formations | .01 |
| Frostig Developmental Test | |
| Figure Ground | .05 |
| Form Constancy | .01 |
| position in Space | .10* |
| Total | .002 |
| Metropolitan Arithmetic Test | |
| Computation | .002 |
| Problem Solving and Concepts | .10* |
| Gilmore Oral Reading Test | |
| Accuracy | .002 |
| Comprehension | .10* |
| Motor Tasks Test | |
| Balance Beam | |
| Forwards | .01 |
| Backwards | .002 |
| Sideways | .01 |
| Balance Board | .01 |
| Skipping | .05 |
| Hopping | .002 |
| Tracking | .01 |

* Approaching but less than significance

TABLE XXVIII

Summary of Gains Favoring the Experimental Group with Non-significant Inter-group Differences

| Test | Level of Significance |
|---|---|
| Slingerland Test | |
| Copying-chart | N.S. |
| Visual Perception-memory | N.S. |
| Visual Discrimination | N.S. |
| Auditory Association | N.S. |
| Total Errors | N.S. |
| Frostig Developmental Test | |
| Eye-Motor Coordination | N.S. |
| Spatial Relations | N.S. |
| Metropolitan Reading Test | |
| Word Knowledge | N S. |
| Reading | N.S. |
| Gilmore Oral Reading Test | |
| Rate: words per minute | N.S. |
| Motor Task Test | |
| Convergence | N.S. |

TABLE XXIX

Summary of Gains Favoring the Control Group with Non-significant Inter-group Differences

| Test | Level of Significance |
|---|---|
| Slingerland Screening Test | |
| Visual Perception-Memory-Kinesthetic | N.S. |
| Auditory Recall | N.S. |

# CHAPTER IV

## SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are drawn from the statistical analysis of the data:

1. The methods of remediation employed in this research enabled the pupils exposed to this training to gain significantly over pupils in a control group in Copying-page and Reduction of Total Errors Plus self-Corrections and Poor Formations as measured by the Slingerland Screening Tests for Identifying Children with Specific Language Disability.
2. Pupils exposed to remediation training gained significantly over pupils in a control group in Figure-ground perception, perception of Form Constancy and total score as measured by the Frostig Developmental Test of Visual Perception.
3. The remediation methods, as outlined, enabled pupils in an experimental group to gain significantly over pupils in a control group in arithmetic computation as measured by the Metropolitan Arithmetic Test.
4. Pupils exposed to methods of remediation gained significantly over control pupils on reading accuracy as measured by the Gilmore Oral Reading Test.
5. Pupils trained with methods of remediation gained significantly over control pupils on the motor tasks of balancing, skipping, hopping and visual tracking as measured by a motor task test.

6. Pupils exposed to the specified remediation methods gained, but not significantly over pupils in a control group in Copying-chart, Visual Perception-memory, Visual Discrimination, Auditory Sounds, Auditory Association, and reduction of Total Errors as measured by the Slingerland Screening Tests for Identifying Children with Specific Language Disability .

7. Remediation methods enabled pupils in an experimental group to gain, but not significantly, over pupils in a control group on Eye-motor Coordination, position in space and Spatial Relations as measured by the Frostig Developmental Test of Visual Perception.

8. Remediation methods enabled pupils in an experimental group to gain, but not significantly, over pupils in a control group in Problem Solving and Concepts as measured in the Metropolitan Arithmetic Test.

9. Pupils exposed to remediation training gained, but not significantly, over pupils in a control group in Word knowledge and Reading as measured by the Metropolitan Reading Test.

10. Pupils exposed to remediation training gained, but not significantly, over pupils in a control group in Accuracy as measured by the Gilmore Oral Reading Test.

11. Remediation methods enables pupils in an experimental group to gain, but not significantly over pupils in a control group in Ocular Convergence as measured by the Motor Rack Test.